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CLINICAL LECTURES
ON
DISEASES
OF THE
URINARY ORGANS

DELIVERED AT UNIVERSITY COLLEGE HOSPITAL

BY

SIR HENRY THOMPSON

SURGEON-EXTRAORDINARY TO HIS MAJESTY THE KING OF THE BELGIANS
EMERITUS PROFESSOR OF CLINICAL SURGERY AND CONSULTING SURGEON TO UNIVERSITY COLLEGE HOSPITAL

SIXTH EDITION

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PREFACE

TO

THE SIXTH EDITION.

I HAVE continued to give this Course of Lectures every year, making such modifications and additions as our increasing knowledge has demanded. The present edition contains Lectures delivered by me at the University College Hospital up to the Session of 1881–2, and comprises therefore all the most recent alterations, making twenty-four Lectures in all, instead of twelve, as in the first edition. Among several important additions, the modern operation of 'Lithotrity at a single sitting' is fully considered and illustrated, and is regarded as superseding the old operation, and to a great extent the operation of Lithotomy.

My aim has been to produce in the smallest possible compass an epitome of practical knowledge concerning the nature and treatment of the diseases which form the subject of the work; and I venture to believe that my intention has been more fully realised in this volume than in any of its predecessors. I have also thought it desirable to follow a course which has been recently pursued, with manifest advantage to the public, in works of general literature, and have issued this edition, which is more comprehensive and complete than any previous one, at less than a fourth of the former price, so as to bring it within the reach of all students.

It may be pardonable, perhaps, to add that I have had the gratification of finding it employed as a Text-book in most of the medical schools of Europe, and translated for that purpose into the French, German, Italian, Spanish, and Russian languages.

35 WIMPOLE STREET, LONDON:
May, 1882.

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PREFACE

TO

THE FIRST EDITION.

I THINK IT RIGHT to say that these Lectures were never committed to writing by me. They were delivered in a colloquial style, after the arrangement of the subject had been well considered, and were reported verbatim by one of our best shorthand writers. The copy furnished by him was corrected, some of those tautologies which seem to be necessary in teaching removed, and then sent to the *Lancet*. But each Lecture still required more space than was available in the columns of a weekly journal, and I further reduced it, perhaps one-fourth. I now present, in one small volume, at the suggestion of, I may truly say, numerous correspondents, known and unknown to me, the corrected copy in full, unchanged in form, and therefore unshorn of the familiarities which the conversational style peculiar—and, I believe, appropriate—to the class-room demands. And I do this, also, because I prefer that these Lectures, originally short, should not suffer any abbreviation, and because I desire to offer, not merely to the members of my own clinical class, but to students at large, some of the fruit of a long and careful study in that field of practical medicine, in its widest sense, to which they relate.

35 WIMPOLE STREET, LONDON:
November, 1868.

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DISEASES

OF

THE URINARY ORGANS.

LECTURE I.

INTRODUCTORY: THE DIAGNOSIS OF URINARY DISEASES. EXAMINATION OF THE PATIENT BY QUESTIONS AND BY INSTRUMENTS.

Gentlemen,—I propose to give a course of lectures on the Surgical Diseases of the Urinary Organs, and my object will be to afford you that information which will be most useful at the bedside. I shall not have much to say about anatomy or physiology, since to teach these would make the course much too long. In the systematic course of surgical lectures at the College it is impossible to communicate a knowledge of all those practical manœuvres, those little attainments and resources, in aid either of diagnosis or of treatment, which one arrives at by experience, and which are so valuable in practice hereafter. Nor is it possible that you should acquire all this at the bedside, since no hospital can furnish patients sufficient for the purpose; but you can learn a great deal by the conversational communications which are made here. It will be my aim to render available the result of experience which it has cost me years to acquire, and I shall do my best to furnish to you what of it is thus communicable during the few hours we may devote to the purpose during the session.

I have selected this course of clinical lectures on the urinary organs for two reasons.

First, because my wards always afford *groups* of these cases; we can always find there abundant material for consideration at the weekly clinical lecture.

Secondly, because I do not know any set of diseases that are so successfully dealt with if you understand what you are about, or any in which you may make such dangerous mistakes if you are not well acquainted with them. Neither do I know any diseases in which you can afford so much relief to suffering; there are none in which a skilled hand can do so much for the patient, or by which you can gain more credit for yourselves. It is therefore exceedingly important that you should be thoroughly acquainted with them.

I hope, in this course of lectures, to carry you through the greater portion of the list of subjects named in Part I.

I. Diseases of the Urinary Passages.

a. Diseases essentially inflammatory.
Urethritis, }
Prostatitis, } acute and chronic.
Cystitis, }

b. Diseases essentially obstructive.
Stricture of the urethra.
Hypertrophy of the prostate.

c. Calculous Diseases.
Of the urethra.
Of the prostate.
Of the bladder.
Of the pelvis of the kidney.

d. Tumours—malignant and non-malignant.
Of the prostate.
Of the bladder.

II. Diseases affecting the Secreting Organs.

All organic changes in the kidney; also those altered conditions of the urine which depend on constitutional disease, such as Bright's disease and saccharine diabetes.

But before commencing, I shall ask you to consider for a moment the title I have affixed to this course—viz., 'The Surgical Diseases of the Urinary Organs.'

Now, you may inquire, 'What are the surgical diseases of the urinary organs, and what are not?' To my mind it is very easy to tell you what are surgical diseases of those organs, but less easy to tell you what are not so. Look at the list before you, and see where the line should be drawn. Certainly the first division belongs wholly to that class—all diseases of the urinary passages, excluding the kidneys, which we will assume to be secreting organs. Undoubtedly all that part belongs to the surgeon. The physician, conventionally, claims the second; but since it is impossible to make a diagnosis of any of those diseases without well understanding the whole, and as the physician does not make a physical examination by means of an instrument, I am compelled to regard all affections of the urinary organs as naturally coming within the province of Surgery. This statement may not be universally received; but when we have considered the matter, we shall see that it is absolutely impossible to make a trustworthy diagnosis of urinary diseases without a practical familiarity with the use of the sound or catheter. I do not say that the physician is incapable of doing this; but, conventionally, the necessary manipulations are not practised by him. And you can no more treat diseases of the urinary organs without the ability to use these instruments, than you can treat diseases of the chest without understanding the use of the stethoscope, and without being practically familiar with the indications which it affords.

The first step in our course is naturally that relating to Diagnosis. I say almost nothing about the pathology and treatment of any one of these diseases to-day. The question before us now is diagnosis; and I need scarcely remind you that this is the most important thing in all diseases—to know accurately what you are about to treat: there is then very little difficulty as to the management. Many books can teach all that is known of one; no book can teach what you must know of the other. The art of diagnosis can only be accomplished by the application of rules after some practice. It is *the first thing to learn and to use*; it is the last thing to be perfectly acquired. Indeed, no man, let him live as long as he may, will ever be a perfect diagnostician. He may approach perfection; but if he is a diligent student, as he ought always to be, he will improve his powers of diagnosis as long as he lives. That is the reason why age or experience gives value to an opinion. Long and intelligent observation and extensive experience enable a man to arrive at a diagnosis with a greater certainty than the younger practitioner can possibly attain.

What is Diagnosis? It consists, first of all, in the acquisition of facts; and, secondly, in obtaining legitimate inferences from those facts.

Now, the acquisition of facts is one of the most difficult things in the world. No two persons ever agree in their statements descriptive of an occurrence to which they both have been witnesses. If I bring a case of disease before you here, and ask ten of you to take as many histories of it, I will undertake to say that each one will materially differ, and that I shall get ten histories, varying from each other in some important particulars. Each will be approximately true; none will be absolutely correct. You must then diligently learn to observe, and to do so well requires special qualities and much practice. Is it not a very striking illustration of what I have said, that if two witnesses relate precisely similar stories of any given event, the suspicion of collusion is always instantly suggested, and is, indeed, very naturally aroused? It has often struck me that the qualities which men of our profession require, and which we should endeavour to cultivate, are precisely such as are necessary to those who are engaged in the exercise of the legal profession; and the men who are really successful in either profession have much in common in intellectual character and attainment. In our profession, equally with that of the law, careful examination of the statement, acute and subtle cross-examination of the witness, and a keen pursuit of the simple fact are essential; and, finally, a calm judicial habit of weighing the facts when obtained. And in both professions the issues raised are equally weighty, and demand in either case the highest qualifications in the individual.

But next, I have not only to call your attention to the necessity for making a careful and accurate diagnosis, it is equally important that you should learn to make it rapidly. For it must be admitted that our proceedings differ from those of the law in this respect; for while—as we have seen not so long ago—several months may be devoted to the critical investigation of a legal claim, and a considerable period of time must mostly be expended on the proof or disproof of any allegation, our decisions are required without delay. While the doctors are deliberating the patient is dying.

Hence the ability to make a diagnosis is not sufficient; the *Art of making a rapid diagnosis* must also be attained. Thus, when called to the bedside, your action must often depend on the first three or four minutes of your interview. It may be easy to go home, quietly think over the case, pull down the authorities, and say, 'I think the patient has so-and-so.' That will not always do: it may do in some cases, and it had better do than that you should attempt to treat the case without having made up your mind as to the diagnosis. But that which will make you successful, that which distinguishes between the intelligent practitioner and him who is not so, is the ability to make a rapid as well as an accurate diagnosis of the case before him.

To this end—and what I have to say applies to all departments of our art—I advise you always to pursue a uniform method. Order and uniformity are essential elements in directing the necessary investigation; and after much thought and experiment, for my own private guidance as well as for yours, I have adopted the following system. Relative to the class of diseases we are studying, there are three methods of obtaining the facts required:—Firstly, by questions of the patient; secondly, by physical examination of the body; thirdly, by examination, chemical and otherwise, of the secretions.

First, by questions. There are four chief questions which I always employ, and always in the same order. They ought, with the minor inquiries which branch out of them, to determine six out of seven cases which come to you. They relate to four signs and symptoms more or less met with in patients affected with complaint in any part of the urinary organs. Frequent micturition; painful micturition; deviation in the character of the urine itself from the healthy standard; the addition of blood to the urine.

The first question, then, which I invariably ask of any patient so affected is, 'Have you any, and, if any, what frequency in passing water?' Then, as a branch of that question, springing out of it, I ask whether the frequency is more by day or by night, or influenced by movements, or by any particular circumstance? How the question applies I will tell you afterwards.

Then, secondly, I ask whether there is pain in passing urine; and whether before, during, or after micturition? Inquire also if pain is felt at other times, and if it is produced or aggravated by quick movements of the body. The locality of the pain is also to be precisely ascertained.

Then I ask, as a third question, 'Is the character of the urine altered in appearance, or is there anything unusual in the stream itself? Is the urine turbid or clear?' Possibly the patient will tell you that it is turbid, but you find, on questioning further, that it was passed perfectly clear, and only became thick after cooling or standing. Also, as arising out of this, you may often ask, 'Does it vary much in quantity?' noting of course the specific gravity. The healthy standard, both as regards quantity and density, however, must be allowed very extensible limits, and both, I need not tell you, are very important elements in regard of renal disease. Then, as regards the stream itself, it may be small, forked, or twisted, or it may stop suddenly when flowing.

The fourth and last question is, whether blood has been passed in any way with the urine; whether the mixture is florid or brown, light or dark; whether the blood and urine are intimately mixed, or whether the blood is chiefly passed at the end or at the beginning of making water; or, lastly, whether it issues independently of micturition altogether.

These are the four questions; and let me remark, that the value of the answers you get will depend very much upon the way in which you put the questions. The patient is not always self-possessed, or he does not clearly understand the nature of the question you put. It is necessary to be very precise and very distinct in your questions if you wish to get accurate answers. Now you will say, how do I apply these questions to the list of diseases before you?

First question—Frequency of passing water.

There is no serious affection of the urinary organs, except one or two which I will name hereafter, in which you have not more or less frequency of passing water. Thus the following is an exception: A man may have stricture to a considerable extent; the stream may be rather narrow, and he may not for some years complain of frequency of passing water, although the symptom will appear sooner or later.

Now I wish you to observe that I have classified these diseases that we may deal with them more easily. At the head of our list there are the inflammatory diseases—inflammation of the urethra, of the prostate, and of the bladder. In all these you have frequency in passing water. Not necessarily, however, in urethritis, until it reaches the distant part of the canal near the bladder; and this is the second instance of exception which I referred to just now. I do not propose to enter upon the subject of urethritis here, as you have frequent opportunities of studying it in the out-patients' room. I am now only referring to this symptom of frequency of passing water as existing more or less in all these diseases at some time or another.

Firstly; in Hypertrophy of the Prostate you have it, and it is remarkable that it is more at night than in the day.

Secondly; in Chronic Prostatitis it is usually present to a small extent; in Cystitis it is, of course, a characteristic symptom. I name these together because they are so intimately connected that the bladder can scarcely be affected without the prostate being more or less involved.

Thirdly; in Calculous diseases frequent micturition is a prominent symptom, and generally its degree is in proportion to the amount of movement permitted to the patient.

Fourthly; Tumours, malignant and non-malignant, are of course attended by the same symptom.

Fifthly; in Pyelitis, and in almost all organic changes of the kidney, in Bright's disease, and in Diabetes, there is frequency of making water. Whenever the natural characters of the urine are altered before it reaches the bladder, the secretion produces irritation. This fact is worth dwelling upon for a moment, as it is not uncommonly overlooked.

Thus, diluted or watery urine is often regarded as un-irritating; on the contrary, it is not generally well retained by the bladder. The bladder is, as a rule, never so content as when it contains a urine of average, or more than average, specific gravity. Some persons who are nervous, and particularly hysterical patients, will pass urine which is quite pale, almost like natural water, and the bladder is always more or less uncomfortable from it. Of course, in Diabetes, you have not only the character of the urine altered, but the quantity much increased, with frequent micturition as the necessary consequence. And I may remark that it is chiefly in renal affections that increase in quantity takes place; while, on the other hand, suppression of urine is always a malady of the kidneys.

The second question has reference to Pain.

The attainment of precise knowledge relative to the nature and seat of pain, will carry you far on your way towards a diagnosis.

In Prostatitis there is usually pain at the extremity of the penis, and felt at the end of passing water—less severe, but resembling somewhat that of stone; as the bladder contracts, when empty, on the tender prostate.

In Cystitis the pain is usually before micturition, because the inflamed mucous lining of the bladder will not bear much expansion, and is sensitive on being distended, as all mucous membranes are when inflamed [of which a sore throat is a familiar example]; and hence the organ frequently endeavours to get rid of its contents. The usual seat of pain is just above the pubes. When cystitis is acute, pain may be felt in the perineum also; but in chronic or subacute cystitis it is supra-pubic, and not at the end but at the beginning of making water, unless the prostate is affected, and then the tender prostate gives a little pain at the end, as I have just said.

In Stricture of the urethra there is often pain about the seat of the obstruction, an idea of which you may obtain by a simple experiment. If, when passing urine with a full stream, you suddenly narrow the passage with your finger so as to diminish the stream to one half or more, you will experience an acute pain.

There may be pain with Hypertrophy of the prostate, inasmuch as this is frequently associated with chronic cystitis, when the pain is before making water, and not afterwards—differing in that respect from stone. The bladder wants to get rid of its contents, and can do so but slowly, on account of the enlarged prostate, which stands as a barrier in the way. During its first contractions, which expel but little urine, there is often severe pain above the pubes and deep in the perineum; but when a third or a half of the contents has issued, the patient is relieved. When the pain is sudden and very severe before the patient can pass urine, he speaks of it usually as 'spasm.' This term almost always implies that the bladder is distended and urgently demands relief: but the same pain may sometimes be caused in a bladder emptied of urine and containing a foreign body, whence involuntary expulsive efforts are made.

I shall not dwell upon Calculous disease of the urethra. The calculus is only a temporary lodger there, and as it can often be felt externally by the hand, there is rarely any difficulty about the diagnosis. Calculous disease of the prostate is also rare. I shall not complicate what I wish to be a simple matter by dwelling upon it, but call your attention to the commoner condition of Calculus in the bladder.

In Calculus of the Bladder the pain is quite distinct in its character: it is felt at the end of passing water, because the bladder being emptied, the rough surface of the stone is left in contact with the mucous membrane, doubtless that covering the neck of the bladder, which is unquestionably a sensitive spot. As soon as sufficient urine has trickled down into the bladder to separate the coats from the stone, relief is obtained. Then the pain is felt at the end of the penis, within an inch of it, about the base of the glans. Furthermore, the pain is increased by movement; in other complaints it is not necessarily so. Put a patient in a rough-going vehicle, or make him jump from a step, or perform any rapid movement, and instantly he feels severe pain, probably at the neck of the bladder, but also and chiefly at the end of the penis. In prostatitis, inasmuch as the neck of the bladder is involved, there is usually some pain at the end of the penis, which is a reason why chronic inflammation of the prostate is sometimes *mistaken* for stone.

With regard to calculus of the kidney, I have little to say here. Of course you have pain referred to the locality, right or left, not often to both kidneys; there is tenderness also, and much increase of pain on movement. It is usually on one side only, and perhaps more frequently on the left than on the right side, and it is often felt over the hip and towards the groin of the affected side, although the calculus is fixed, and there may be no reason to believe it will pass by the ureter. In affections of the kidney, too, the pain is sometimes felt only or chiefly about the bladder and urethra, a circumstance never to be forgotten.

One cannot, perhaps, say much about any characteristic pain in connection with tumours. They may be situated in any part of the bladder; may obstruct the urine more or less; and accordingly as they produce cystitis, and obstruct the flow of urine, pain will be experienced.

The third question is as to the characters of the urine itself.

Now, suppose your patient has told you that he has frequency in passing water, pain at the end of the penis and at the neck of the bladder, and that the pain and frequency are aggravated by movement. You may begin to say to yourself, 'Perhaps the man has stone in the bladder, and I shall have to sound him.' Two questions only have already put this probability in your way, and you interrogate him as to the character of the urine. See how this carries you a step further. We recommence our list as to this inquiry.

A preliminary remark, however, about examining urine. I do not propose to teach you here at present a systematic mode of doing this; because it is supposed not to be in my department, and you would only be repeating that which it will be your duty to learn elsewhere, and I hope you will do so thoroughly. But there is this hint which I may at once give with respect to it. Whenever you want a specimen from your patient to examine, do not tell him to send you a bottle of it passed in the usual way, or you will get a mixture often of doubtful value. What you require is the secretion of the kidneys, plus only anything there may be in the bladder; you do not want it complicated with anything which may come from the urethra. Let the man pass two or three tablespoonfuls through the urethra first, so as to sweep out whatever be there, which may be thrown away, or be put into a separate bottle, after which you will get a pure specimen—at any rate one of which you will know the source. You will have the renal secretion, plus only whatever deposit may be produced in the bladder. Suppose the patient has gleet or chronic prostatitis: there will then be a quantity of muco-purulent matter in the urethra. If all this be carried into one vessel with the urine, how will you determine the different products, and decide, by the eye or by the microscope, what has come from the urethra, what from the prostate, and what from the kidneys? You cannot do it; but if you get rid of the source of error by flushing the urethra, so to speak, by passing the first two or three tablespoonfuls into a wine-glass, while all that follows is passed into a separate vessel, such as a tumbler, you will generally have a sample of urine that you can rely upon for examination. If I felt disposed to indulge you with gossip, I could tell you stories of the gravest blunders committed by not attending to that simple point. I can at all events tell you that I have more than once known a patient treated for pyelitis who had nothing but a profuse discharge from the urethra; the urine had been sent twice a week for examination in a bottle scrupulously made clean for the purpose, and because a quantity of pus was found in it, the patient, who had some symptoms corroborating that view, was treated during some months for pyelitis; another observer at length found out that the whole of the matter came from the urethra, for when the urethra was flushed into the first glass all the matter was there, and the remaining urine was clear and healthy; finally, the 'pyelitis' soon disappeared under local treatment of the urethra. I do not know whether any one else may tell you of that simple mode of determining this matter; and I will assume that in the future you will none of you make such a mistake as that I have mentioned. I only know too well how necessary it is to call attention to this mode of examining urine, and how seldom it is practised.[1]

Referring first to prostatitis, it is always associated more or less with shreds in the urine, which come from the prostatic part of the urethra; and if the urine is separated in the manner described, you will find that the whole of the thick matter will be in the first glass, while that remaining behind will be clear. How would it be with regard to calculus? You might have muco-pus in the first glass, but you would have more in the second from the bladder. It is not common that there is calculus in the bladder without the production of unhealthy mucus, and also of some pus from the lining membrane of the bladder itself. Occasionally, but rarely, I find a man with stone in the bladder having perfectly clear urine. Not commonly do I sound a man for stone who has clear urine, unless he has marked symptoms, because the presence of stone in the bladder almost always gives rise to a certain amount of cystitis, and there is deposit in consequence. If the patient passes shreds of thick matter in the first glass, and the urine left behind is clear, and has symptoms like those of stone, rely upon it that it is a case of chronic prostatitis. In calculus of the bladder there is nothing to note about the nature of the stream, except that it stops suddenly sometimes; but this is by no means a common symptom.

The character of the urine in one of the forms of chronic cystitis is well known. There is at the bottom of the vessel a thick mucilaginous deposit, which does not issue in a stream, but falls out in a mass. In another and very common form of chronic cystitis, it is simply cloudy, without any of the dense deposit described. In acute cystitis the urine is cloudy, and there is a considerable deposit of pus.

In stricture of the urethra, unless chronic cystitis has been set up, there is no deposit from the urine; but there are usually a few shreddy deposits in the first glass. Here the character of the stream is important. If, when the patient is passing urine, you see a very thin, or small twisted stream, or urine issuing only in drops, you will know that there is an obstruction, most likely stricture; because, although in hypertrophy of the prostate, you may have the stream much diminished, it will be a stream which falls downwards from the organ. In stricture, force may be brought to bear on the stream, so that, however small it may be, it is often fairly propelled; but in hypertrophy, in which the expelling apparatus is involved, the muscles cannot act, and, therefore, however large or small the stream, it generally falls more or less perpendicularly.

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[1] See further remarks on this subject at the *close of the lecture on Hæmaturia and Renal Calculus.*

With regard to the débris of tumours found in the urine, the microscope sometimes throws light upon their nature. No doubt you may see villous growth or cancer-cells in the urine; it is difficult to identify them. I have seen such cells declared to exist by good observers in cases in which cancer was not present. Young pavement epithelium is easily mistaken for them.

Going upwards from the bladder, we may note pyelitis, more or less chronic—a disease in which the condition of the urine is only one symptom among many others which must be observed before arriving at a conclusion. In all cases you will ascertain with precision if albumen or sugar is present in the urine by the appropriate tests. But do not make the very common blunder of inferring organic disease of the kidneys, because you find albumen in the urine, the source of which is pus or blood, which may have issued from any part of the urinary passages. This subject will be fully discussed hereafter in the directions for the examination of the urine at the end of this volume.

The next question is, 'Do you pass blood?' and the answer will enable you to form an opinion on most cases—not quite, because in any case it may be necessary to sound before the diagnosis is complete. In prostatitis there is often a little blood at the end of micturition, as in stone; in cystitis there is not necessarily blood, unless it is acute and far advanced; in stricture of the urethra there is not necessarily blood; and in hypertrophy of the prostate not necessarily. You may have it often only as the result of instruments. The inquiry respecting blood bears chiefly on the question of stone. Just as in phthisis a large proportion of patients have hæmoptysis at some time or another; so in about the same proportion of cases—say four out of five—there is some blood observed at some time during the history of a vesical calculus.

I wish you to pay particular attention to these questions, because I shall assume acquaintance with them to underlie much of what I have to say hereafter. What is necessary to be added with regard to observation by the eye, by the hand, and by instruments, will come under each particular subject hereafter, and I will only briefly allude to it to-day.

By the eye you observe mainly whether the bladder is distended or not, and you are assisted in ascertaining this by palpation and percussion. The lower part of the belly is often exceedingly prominent in cases of retention. You examine the perineum and scrotum also, with a view to extravasation of urine, perineal abscess, fistula, &c. The condition of the glands in the groin is occasionally a significant fact first noted by the eye. So also is the condition of the external meatus and parts adjacent.

By means of touch you attain a knowledge of the size and form of the prostate on introducing the finger into the rectum; or of tumours adjacent; of the presence of induration or fluctuation within reach of the finger; and of the degree of sensibility there. Also of the situation of an instrument introduced by the urethra; the presence of false passages or of fistulous openings leading into the bowel. The size and situation of a calculus may be sometimes noted with advantage in this manner.

And now we come to the question of instruments. The instrument is to be regarded as a long finger, as an extension of tactile sensibility. The finger is not long enough to search the narrow passages, and we lengthen it therefore by means of an instrument. By a similar analogy we may augment our power of vision by means of the endoscope—whatever that may be worth, a matter we shall presently consider.

Suppose, then, such a case as that to which I have already referred, in which there are frequency of passing urine, pain at the end of micturition, pain on any considerable movement, thickening of the urine, blood passing occasionally, but more on movement—you regard it as highly probable that the man has stone. You cannot arrive at a certainty without instruments. You may have almost all these conditions produced by certain changes in the kidney and in renal calculus, and you cannot distinguish them unless you skilfully explore the bladder with a sound. When I claim great value for this instrument, quite understand that I am by no means desirous that in the case of every patient who comes to you and complains of some frequency in water, or pain in the act, you say, 'Lie down, and let me pass an instrument.' Perhaps the surgeon may be a little apt to abuse his power of passing instruments: which are to be applied only when absolutely necessary. I hold that an instrument, *per se*, is an evil—a very small one or a considerable one, according to the manner in which it is employed—and that it is never to be used unless there is good reason to believe that a greater evil is present which it may mitigate or cure. But when your patient has the symptoms named, you will be doing him an injury unless you resort to it. In cases of stricture the instrument is also necessary, for the purposes not only of diagnosis but of treatment. It is equally necessary in order to ascertain the condition of the bladder itself, as to the presence of tumour, the growth into it of hypertrophied prostate, whether it contains fluid or not in certain conditions, &c. Thus a patient may make water very frequently, exert all his force, be very certain that he has emptied the bladder, and yet be quite deceived. How can you determine his condition? There is a prominence above the pubes which you have no doubt is a distended bladder; but it is just possible that it may be a solid tumour. You cannot know whether the bladder is emptied unless you pass an instrument. Many a man has had a catheter introduced into the bladder immediately after he has passed as much water as he could, and a quart is found to have been left behind, although his own sensations led him to believe that he had expelled every drop. We shall see more of this when we come to the subjects of retention of urine and hypertrophy of the prostate.

Lastly, I will take the opportunity of showing you that the eye may be assisted to a certain extent by what is called the endoscope, which is simply an instrument that we have long been in the habit of passing into various cavities of the body —the ear, the vagina, the rectum—for the purpose of bringing reflected light to bear upon the interior of those cavities. For some years past this instrument has been employed for the urethra. It is more than thirty years (1882) since I first saw the endoscope so applied. This was in the hands of Mr. Avery, of the Charing Cross Hospital. As I was turning my attention somewhat to this subject, he asked me *to see some of his patients*, and a new instrument he was then making. It was a long tube, precisely similar to this which I hold in my hand, with certain arrangements enabling one to see deep portions of the urethra. He showed me cases of stricture, but I do not think he looked into the bladder. He paid a great deal of attention to the subject, and the instrument was brought by him to a certain state of perfection; unhappily, however, his death occurred shortly afterwards, and the thing was lost sight of here. Various attempts had been made with the same object, long before, as many have been since, but I do not know that there is anything on this table which is very much superior to what Mr. Avery showed. Within the last few years M. Desormeaux, of Paris, has paid great attention to the endoscope, and has perfected one of his own, consisting of a similar tube, but with different appliances. The various modes in which light is applied constitute the differences between the various kinds of endoscope. In all of them there is a tube of this description to pass into the cavity. Twenty years ago I had an endoscope of M. Desormeaux's, and exhibited it in the hospital —the instrument which you see here. Dr. Cruise, of Dublin, has brought it to greater perfection, and has produced a better instrument than we heretofore possessed. This also is here, and you have often seen it in the wards, applied by me both to the urethra and to the rectum. I may tell you at once, that if a man has a good and a tolerably practised hand, with a fair share of intelligence, I do not think he will gain a great deal by the endoscope; and if he has not, I think it will be of no use at all. There are some few cases in which he may find it of value; but do not expect that the endoscope is to work marvels in the diagnosis of surgical diseases of the urinary organs. In ninety-nine cases out of a hundred you can arrive at the necessary information without it. And it is not the easiest thing in the world to apply. As already remarked, a man should not be put unnecessarily to the pain and inconvenience of a sound or a catheter; but examination by the endoscope is a somewhat more irritating and tedious process. In certain exceptional cases, in which you are unable to arrive at a conclusion without it, you may perhaps employ it to some advantage. Now, here is a patient on whom

I have never used it, and whose case will offer a certain test of its power. The man before you had an exceedingly bad stricture of the urethra, which I cut internally last Tuesday week. He is now perfectly well. He could not pass a drop of urine before the operation, but now he is able to pass it naturally; and you will agree with me that a great deal must have been done since the day named to make that change. I cut through the strictures deeply, and now we shall see whether we can find the cicatrices.—You see we have now made a careful and prolonged examination. The urethra is of a more dusky red about the part which has been affected, but that is all which can be observed. Changes in the colour and texture of the mucous membrane of the urethra are those which are most easily seen, and which it may be sometimes of importance to note. The orifice of a stricture may be sometimes seen, but the result is without practical utility.

Very little can be seen by it in the bladder, because more or less urine must always be present, and urine too which is usually cloudy, or containing blood. But the end of the instrument will often produce enough blood to obscure the tiny field of vision available, especially if tumours or other local diseases are present. There is no doubt that a calculus may be easily seen, or rather the small portion of it upon which the end of the sound impinges; but I have never gained anything by the sight. A calculus smaller than a pea may be easily found by delicate sounding, and an audible note elicited from it, more easily than you can see it through the endoscopic sound. I may mention that no one has yet been able by its means to identify the verumontanum, and if you cannot see the verumontanum, I think it is quite possible that minute pathological changes will often escape you.

But lately another attempt to improve it has been made. The idea of carrying an electric light into the bladder itself (and also into other cavities) appears to have originated with Dr. Nietze, now of Vienna, but its realisation is due to the patience and perseverance of Leitner, the surgical instrument maker of that city.

The apparatus consists of a stout wooden table, containing instruments, &c. Attached to it is a light stage, several feet high, supporting a vessel of water; and on a frame near the floor is the electrical battery with its appliances. This apparatus is placed by the side of the patient, who should be recumbent on an ordinary operating table, so as to occupy a height convenient for the purpose of examination. It may be thus used in an ordinary ward, but it is more efficient in a darkened room, like that ordinarily employed for the ophthalmoscope.

The electrical current is produced by two rather large Bunsen cells, and the positive and negative conductors, two long and slender wires, are attached to a hollow silver sound of the ordinary form for examining the bladder, by means of a movable collar round its handle, one of the wires entering a small channel in the sound itself which it traverses to the end. Arriving there it enters a cavity within the beak, and joins a platinum wire there about half an inch in length, the other end of which is soldered to the metal of the sound, and the latter itself forms the connexion with the opposite wire or pole. The platinum, which becomes incandescent on the completion of the current, is covered by a glass plate isolating it from lateral contact. Finally, the end of the sound which contains the platinum wire has to be kept perfectly cool by special means adapted to the purpose. This consists in the maintenance of a constant current of cold water supplied from a reservoir, placed seven or eight feet above the operator. The current descends through a small flexible tube to the collar of the instrument connected with two capillary channels, only one millimetre and a half in diameter, which pass through the whole length of the sound, coursing round the heated wire at its termination, so that the water is constantly flowing in by one tube and out by the other, to issue finally drop by drop through the returning tube into a vessel placed to receive it. Holding the collar with the left hand, the operator rotates the sound with his right, when on looking through a central cavity forming the axis of the sound, any portion of organ adjacent to the end of the sound is seen to be brilliantly illuminated. A small piece of gravel, a pellet of mucous, the rugæ and sinuses of the mucous lining of the bladder, of its natural tint, or with an inflammatory injection, may all be most clearly seen.

As a triumph of mechanical skill over extreme difficulties, it is impossible to admire the performance too much. But it is necessary to remark that much preparation of the bladder itself is necessary; that some irritation of the organ must be regarded as a highly probable result—as, indeed, is often unavoidable from the use of this or of any other endoscope. If the urine is bloody or cloudy with mucus, nothing is visible; the bladder must be washed, and then be partially distended with clear water or with air before the instrument can be applied. If the urine is quite clear no preliminary washing is necessary, and a few ounces should be present in the bladder.

Having tested the power of this instrument myself, I venture to express in cautious terms my views as to its use. First, I do not regard it as likely to help us in cases of difficult stricture or retention of urine. Nor is it required to explore a bladder for any remaining fragments after the operation of lithotrity. On the other hand, there are some morbid conditions the existence of which we sometimes suspect, but cannot positively affirm to exist, whose presence may now be ascertained through the agency of the new endoscope. I refer to the identification of sacculated stone as the cause of persisting and unrelieved symptoms; to the detection of pedunculated growths and of villous disease of the bladder, removable by operation; and, lastly, to the investigation of the nature of foreign bodies, other than calculi, which have become lodged there. A precise knowledge of the nature, size, and position of a foreign body might enable us to devise a safe and certain means of removing it in place of a tentative, uncertain, and hazardous proceeding. All these cases, however, are more or less rare; nevertheless it is our duty to be provided with every resource, whatever it may be, which enables us to deal more effectively than heretofore with conditions on the management of which grave issues depend.

It ought to be added, moreover, that the apparatus is complicated, and requires the expenditure of much time, a practical acquaintance with electrical instruments, and great care in working it in order to attain any results.

It is impossible to discuss now that large and important department of diagnosis which comprehends the various modes of examining the urine. It demands a separate and practical demonstration, to be given at the end of the course.

LECTURE II.

ON SOME POINTS RELATING TO THE STRUCTURE AND FUNCTIONS OF THE MALE URETHRA.

In view of a consideration of the more important affections of the urethra, with which I shall naturally commence, I desire to depart from my usual habit a little to-day, and to speak more at length on a topic which I always allude to slightly, but not otherwise, because it is not part of my plan to teach anatomy and physiology here. But I find it necessary to complain of what I will speak of as the 'too mechanical method' of treating urethral diseases, which I think has been obtaining of late in some parts of the Continent, and perhaps in America. What I mean by that will appear as we proceed. I always protest against it in *this course of lectures*, but something more than this appears to me now to be desirable. I dislike to be polemical in this or any other subject, the practical side of which is so important; and I would infinitely rather for my own peace and comfort simply tell you what I think you ought to do in relation to various circumstances which come before you, and not also have to point out treatment pursued by others which I think you ought to avoid. However, I have the conviction that much of the treatment now in vogue is imperfect and less valuable than it might be, since it is founded on views of the urethra itself which are erroneous; or rather, I should say, it originates in a want of consideration which appears very widely to exist as to the nature and function of the urethra.

The treatment of urethral disease of which I complain has its origin in the notion that the urethra is a mere flexible tube, closed at or near its junction with the bladder by some kind of muscular apparatus, sphincteric or otherwise, through which fluids will pass indifferently in either direction. No idea, however, can be more erroneous, and treatment founded on it must be defective.

At the outset, then, let me say that it is absolutely essential that you should have a tolerably accurate knowledge of the nature and functions of this so-called tube.

I draw for you on this board the kind of diagram usually supposed to represent the bladder and male urethra. This diagram has something to answer for in producing the erroneous views I refer to. It represents the urethra as a tube, and as more or less open. (Fig. 1.)

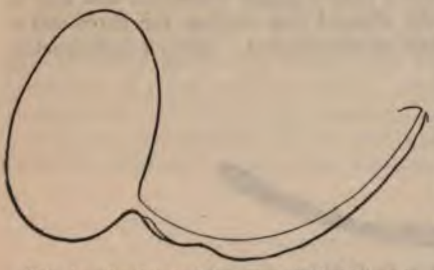

FIG. 1.—Anatomical diagram of bladder and urethra.

Let me give you an illustration of my meaning, and not an unimportant one. I believe I am correct in stating that almost every patient who presents himself for treatment of a urethal discharge, when advised to use an injection, gets some such advice as this, when the manner of doing it is explained, as it ought to be, in detail:—He is told to inject a certain quantity of liquid into the passage by means of a syringe of some kind, often one of considerable size, and he is admonished that before he does so, he is to make pressure with the fingers of one hand on the line of the urethra, about four inches from the external meatus, lest the fluid should pass further down to enter or perhaps irritate the ducts which open into the prostatic portion, and occasion inflammation of the neck of the bladder or a *swollen* testicle. This idea is very far from correct; and such advice simply demonstrates that the person giving it is not really acquainted with the structure or function of the part he is treating. Want of thought originally has produced, and the influence of ancient tradition has perpetuated, the error which vitiates much of our treatment in its various forms.

First, let me assure you that the urethra is not a tube at all, in any sense in which we employ that word. It is not like a gas-pipe, or an india-rubber tube, or even a flaccid tube of any membrane whatever.

It is rather *a continuous closed valve, capable of transmitting fluids and solids in one direction only, and transmitting nothing whatever in the opposite direction, except in obedience to applied force.* Its length in the male makes us think of it as a tube, but this is a mere accident of sex. An inch or less is amply long enough for its urinary functions, as in the female; and all the length it possesses above that, although needful to constitute it a spermatic conduit, is quite useless *as a urethra proper*, and renders it liable to disease and accident—the price, and a heavy one, let me tell you, which the male pays for his specially distinguishing feature. In illustration of this, I have but to refer you to the difficulties and dangers associated with stricture, retention of urine, and calculus, which are comparatively almost unknown in the other sex, simply because the outlet from the bladder is a 'urethra' and nothing more. But in the male this outlet is a long route or chink, traversing soft and most delicate vascular and nervous tissues, its walls or sides always firmly closed, and never opening except for a few seconds, during which fluids have to be transmitted from the body. Then, for a few seconds, it is distended more or less, and becomes a tube if you please, for this short time and this only, equalling, perhaps, at most three minutes in the twenty-four hours. All the rest of the time it is firmly closed, and not one drop of fluid can pass from the bladder. Of course, oozing of liquid which is generated in the walls of the tube, as in gonorrhœa, or which enters it by ducts, as spermatic fluids, may escape, but always, inevitably, if the passage is healthy, in the outward direction only.

I have next to observe that during these few seconds, when the valve is be said to assume temporarily the form of a tube, it is one marked by great deviations in its diameter; being, in fact, very differently affected at various parts of its course, by the various structures which surround it. This fact has long been theoretically known and generally thus recognised. I will show you illustrations of this statement from the works of Sir Everard Home and of Mr. Guthrie, who made casts of the urethra in wax and other materials. This natural condition of variation in diameter when distended is scarcely less important than the condition of absolute closure which I previously explained. The annexed diagram is reproduced from Sir E. Home's work.[1] (Fig. 2.)

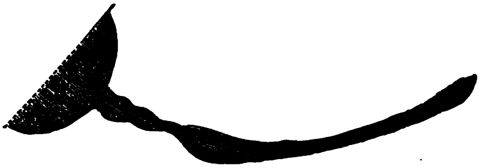

FIG. 2.—Diagram of urethra from Sir E. Home, showing its extensibility.

Having thus far illustrated briefly, and necessarily somewhat imperfectly, the nature of this valvular passage, let us see how far the ideas which I want you to acquire relative to the urethra affect two important points in practice.¶ First, that simple matter of making an injection into the urethra. You have to introduce a fluid for the purpose of therapeutic contact with the walls of this closed passage; you have to distend it, and some little force is necessary; not a single drop can enter, much less run down into it, unless the liquid is forced in by a piston, while the orifice of the urethra is kept carefully closed around the tube of the syringe introduced. The walls of the passage lying closely applied to each other become opened only by the pressure of the fluid driven in, and they are distended just so much and so far as the quantity employed determines that they must be. Thus you may safely reckon, as the result of my observation, that a syringe containing one fluid drachm or drachm and a half, is amply sufficient, and that it will distend the urethra for three and a half or four inches. Even a half-drachm syringe sometimes suffices. Here is one of each size, and it is scarcely necessary to say that these small instruments are much more easily managed by a patient than larger and longer ones. But most patients, unless specially taught to use the syringe, never introduce any injection at all. Unless the orifice of the urethra is carefully closed while the act of injecting is performed, the fluid simply leaves the end of the syringe and flows out by the external meatus. And thus it is that in every case after the injection has been made, the moment the orifice is unclosed the fluid is rapidly expelled by the contractile force of the urethra, and no appreciable quantity remains within. So much, then for any fear of its running down to the neck of the bladder. Of course, if an injection is too strong—and in my opinion the solutions of metallic salts employed for the purpose in gonorrhœa and gleet, are generally far too strong—the anterior part of the urethra is inflamed, and extension backwards may easily take place; but that is no part of our subject now. But let me further say that so far from your being able, even with the power of the syringe, to send an injection into the prostatic part of the urethra, you will not do so by any ordinary force, unless you can at the same moment voluntarily relax the muscles which surround the membraneous urethra, and so allow the fluid to pass—a thing perfectly possible with very little practice to accomplish. It is due to the same circumstances that you cannot inject the bladder except by passing an instrument into its cavity. In fact, this valvular passage stoutly resists all intrusion from without, and admits no fluid except in obedience to pressure which the muscles are unable to resist.

I must just remark, in order to anticipate a possible objection to my statement relative to the valvular action of the urethra, and its power to transmit bodies in the outward direction only, that it is well known that certain foreign bodies have been able to pass inwards when introduced by the external meatus. I refer to two typical ones, both of which have been occasionally known to reach the bladder after being fairly lodged within the urethra. I refer to an ear of barley or of rye, both of which you will recollect are bearded, and also to a common hair-pin which is wedge-shaped. Either of these bodies, if completely introduced, and also in such a manner that the beards or the points are directed outwards, will traverse the urethra in the direction inward. These, however, you will doubtless at once see are not in the least degree exceptions to my statement. It is an old schoolboy's paradox to put an ear of rye in his jacket-sleeve, when, with slight movements of his arm, although directed downwards, the ear soon finds its way upwards to his shoulder. If the arm were kept perfectly motionless there would be no change of place in the ear of rye. So, when introduced within the urethra, the involuntary movements of the urethral muscles, designed to expel the intruder, act on the ends of the bearded corn, or on the ends of the hair-pin, and drive it on in the only direction it can travel—namely, inwards. I am not sure that it was necessary to mention this, but I have known the peculiar action of these bodies referred to as militating against the uniformity of the action of the urethra referred to, while in fact it does but illustrate its existence. If the urethra submitted tranquilly to the intrusion, and made no expulsive effort at all, the foreign bodies would not travel; as it is they must move, and can only do so in one direction. Of course it is due to this function of the urethra that gravel and small calculi are expelled in great number, and that the morbid excretions in gonorrhœa, &c., always issue externally, and never go backwards to the bladder.

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[1] *Practical Observations.* By Sir E. Home. *Vol. I. London, 1805.*

The second point of importance in which the structural function of the urethra which I have described should affect our practice is associated with treatment of stricture of the urethra. I do but allude to this now, and shall reserve what I have to say on this head until a future lecture, when I shall enter fully on the subject.

LECTURE III.

ON STRICTURE OF THE URETHRA AND ITS NATURE: AND ON THE DIAGNOSIS OF URETHRAL CONTRACTIONS.

In commencing this course, I shall take to-day the subject of stricture; and I do so because, if not really one of the most common among urinary disorders, it is often supposed to be so. Among the many complaints of this class respecting which you may be consulted, perhaps none will be more talked of than urethral stricture. It does not follow, however, that stricture is really so common; in fact, it is much less so than many suppose. The word happens to have been popularised, and therefore when a person experiences a little trouble in passing water, he is very apt to say that he has stricture. Certainly, in three out of four cases in which persons do so, I find there is nothing of the kind, but often merely some temporary cause of iritation.

Then it must be confessed that even amongst the profession there is some confusion as to the mode in which the word 'stricture' should be employed. It is said—and formerly I said it myself, because I originally adopted the conventional classification—that there are three kinds of stricture—organic, inflammatory, and spasmodic stricture. Now, it would save some confusion if we employed this term for only one kind—namely, organic stricture: and this, indeed, is what I shall propose to do.

And what is organic stricture? It is a deposit of lymph round the canal of the urethra at some point, which, not allowing the canal to open to the stream, narrows the current to that extent. There has usually been some chronic inflammation, most commonly in the bulbous part of the canal, but occurring in the anterior part also, and a deposit of lymph has taken place in the submucous and in the vascular tissues surrounding the urethra; this lymph forms fibrous bands, which subsequently become somewhat rigid, while they more or less encircle the passage. We talk of the *contraction* of the canal; the use of which term is due to a popular and not very correct notion of the matter, as was demonstrated at our last lecture, although it answers well enough for mere practical purposes. You will therefore do well again to remember, in connection with the pathology and treatment of urethral diseases that the urethra is not an open tube, except at the moment of its distension by an out-flowing current; it is always absolutely closed by muscular fibres, and only when it is habitually prevented from fully dilating to the stream of urine is it affected by stricture.

And this organic stricture is a permanent condition. Once acquired, it cannot be entirely dissipated by any known means. It cannot be removed by absorption, although the contrary has often been affirmed. You may dilate it, you may cut through it, but there, more or less, the morbid elements must always remain. When a man once has organic stricture, he has it for ever. If any exceptions exist, their rarity is so extreme as practically not to invalidate the axiom laid down. Whatever treatment you employ, there is always a greater or less degree of rigidity in the urethral walls ever afterwards, and this increases with age. For all the fibrous tissues, as you know, become less extensible, as a rule, in advanced years than in youth; and this influence of age no doubt affects also those morbid tissues which limit the extensibility of the urethra in stricture, and is one reason among others why it so generally becomes less dilatable as the patient advances in years.

Now touching 'inflammatory stricture' and 'spasmodic stricture;' what has been termed 'inflammatory stricture' is merely a temporary local inflammation of some part of the canal, which is then narrowed for the time. The patient is unable, as long as that inflammation lasts, to pass water, or at best with difficulty. An inflammation with this result affects only the prostatic part of the urethra, which is not, as you know, the seat of organic stricture. If you consent to call this condition stricture, you may as well say that the throat is strictured when it is partially closed by inflammation, and the tonsils are swollen. We only speak of stricture of the œsophagus or gullet in reference to an obstruction which is organic, when by some deposit the passage is permanently narrowed, and we never speak of stricture there under any other circumstances.

So with regard to what is called spasm. The urethra may be narrowed to a certant extent by spasm—that is to say, the water may be prevented from passing outwards from the bladder, because there is some irregular action of the muscles around the canal. But the affection is only temporary; it does not necessarily imply any organic change; although sometimes its occurrence depends on the pre-existence of organic change, yet this spasm in itself is by no means to be regarded as urethral stricture.

I will tell you what 'spasmodic stricture' often is. It is an exceedingly useful excuse for the failure of instruments. It is a refuge for incompetence. When you cannot pass a catheter, when you find it exceedingly difficult to introduce any instrument, and in fact wish to relinquish the trial, it is a convenient thing, and has always been so recognised, for the operator to say, 'There is spasm.' Indeed, I believe he often persuades himself that it does exist, although, in my opinion, it does not, or at least very rarely. 'There is spasm,' says he, 'now in the muscles, and it will be prudent at present to desist from further attempts to pass an instrument.' And no doubt when this is said it is so. Now, I do not think that you ought ever to fail in passing an instrument because there is spasm. Spasm may prevent the urine from going outwards; I do not know that it ever prevents the instrument from going in. In most cases it is failure of the hand, not spasm of the urethra. Still I cannot deny that it is a useful excuse—that it has a sort of foundation in fact, and may thus be often a better explanation for the patient than anything else, when the instrument does not pass. But now let it be understood that when stricture here is spoken of in future, I shall refer only to organic stricture, in the sense already described. All the mechanical treatment which I shall have to speak or will have reference only to that kind of stricture. In 'inflammatory stricture,' of course, you have no occasion for instruments, unless retention of urine is present.

Now, what are the symptoms of stricture? First, of course, there is the smallness of the stream, depending upon the narrowed state of the canal. Whatever the narrowing of the canal is, in that proportion there must be a narrowing of the stream. Still, it is not to be forgotten that the degree of narrowing varies much at different times in accordance with external circumstances, cold, errors in diet, and the like; one thing only is constant, the stream is always smaller than natural. Next, there is often some straining to pass water, corresponding to the obstruction of the passage; and the stream itself is flattened, twisted, or divided. This condition is accompanied by pain at the seat of stricture, and sometimes over the pubes, if there is any cystitis also. Associated with these, it is common to have a little discharge from the urethra; indeed, a gleet is often the only thing which the patient notices at first, and the surgeon, finding that this is not readily cured, uses an instrument and discovers some degree of stricture. Frequency of making water, as I told you in the first lecture, is not always present, although it always is so when the case is severe and of long standing.

Supposing a patient to apply to you with all these symptoms, you will endeavour to see him pass water. He probably lays some stress on the fact that the stream is twisted or divided. Do not attribute much weight to this circumstance by itself, for a stream is often twisted when there is no stricture. This may be due to an alteration in the external meatus; for as the stream issues from the passage it is modified by alterations in the natural shape or extensibility of the external meatus; thus, after repeated inflammation there, the lips of the meatus are sometimes slightly thickened, so that the urine can only issue in a flattened and consequently twisted stream; a by no means uncommon occurrence. But if there is no other morbid change, however flattened the stream may be, the absolute bulk or volume of the stream is not diminished, and there is no stricture.

The question of diagnosis by physical examination next presents itself.

Let me at the outset observe that on almost all occasions of examining a patient for the first time with an instrument, one of tolerably full size should be selected, say not less than No. 8, 9, or 10 of the English scale. Nothing is better for this purpose than a slightly curved English gum elastic bougie, with a blunt and not a tapering end. It is neither necessary nor politic to produce an instrument, at first, of greater calibre. Even then the patient will probably remonstrate, and may very likely say, 'Why do you employ so large an instrument?' Soothe his fears by telling him that you do not propose necessarily to pass it, but mainly to learn what is the condition of the canal. For if you use a small instrument at first, it may pass through a stricture, if one exists, without detecting it; but if the large instrument goes on easily into the bladder, you have the satisfaction of informing your patient that he has no considerable stricture, and you must look further for the cause of the difficulty.

Again, let me warn you that, in passing the instrument through a healthy urethra, it is quite common to meet with circumstances which may mislead you. I have spoken to you of error on the part of the patient, and I am bound to say that the surgeon who is not much practised in these matters may also be deceived. What are the sources of fallacy to which he is exposed? How is it that he sometimes fancies there is stricture when there is not? You may be placed in circumstances hereafter in which opportunities of often seeing this disease do not occur, and in such it is no great discredit to a man to think that he has found stricture where none exists. If, however, he professes to be an operating surgeon such a mistake would be discreditable. But if he has not had much surgical experience, he may encounter some difficulty with an instrument in the urethra, and may suppose, erroneously, that it is due to stricture. Now, I want to guard you against this; for, though you may not all be operating surgeons, I wish no one to leave any course of lectures which I may give, without knowing precisely what are the sources of fallacy, so that I may not hear of any of you making hereafter such a mistake as that to which I have referred.

First, then, observe that close to the external meatus of the urethra is a source of fallacy—I mean the lacuna magna. Next, at a part of the passage which is about five or six inches further [a diagram referred to], the bulb joins the membranous portion, and the canal, from being wide or dilatable, becomes less so; a condition not infrequently mistaken for disease. Lastly, there is a source of difficulty at the neck of the bladder. These are the three points at which persons may be mistaken in passing an instrument in the healthy urethra, and may form erroneous notions in consequence relative to the presence of stricture.

Now, bear in mind that the urethra is not a tube, but merely a sinuous passage with soft, delicate, and vascular walls lying in close contact with each other; so that nothing is easier, when traversing it with an instrument, than to find some obstruction in the folds or lacunæ of the mucous membrane. Thus, as I have said, it is quite possible to find obstruction at the very outset by engaging the point of the instrument in the lacuna magna, an occurrence which is embarrassing to a beginner. Whenever, then, you introduce an instrument, let your first thought be to keep its point on the floor, so as to avoid that obstacle. You wish, of course, to pass it well for the patient. Perhaps he has had instruments passed before, and you desire to succeed at least as well as the preceding operator. Now, there is nothing which a patient appreciates so much as the easy passing of an instrument. It is a disagreeable operation, and if you pass it more easily than other persons, you will probably retain your patient as long as he requires assistance of that kind. If your instrument stops, by getting into the lacuna magna at the outset, he infers you to be a bungler, and perhaps will not ask your services again.

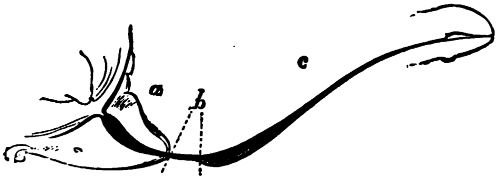

FIG. 3.—Diagram of urethra in natural condition, *a*, *b*, and *c* representing the prostatic, membranous, and spongy portions respectively.[1]

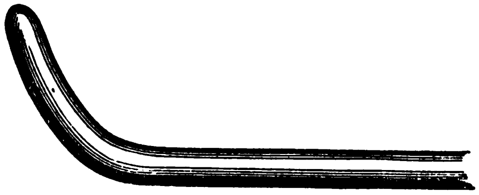

FIG. 4.—Bougie, with point turned up.

Now you see represented in this diagram the bulb of the urethra. The canal is more distensible at this point, in front of *b*, and when it arrives at the deep perineal fascia, the canal is much less distensible; being closed, indeed, here by a special muscle. Practically, therefore, it is much wider in the bulbous portion than it is at the membranous portion, and when the instrument arrives there it is apt to meet with obstruction. This is the place where most false passages are made; the instrument is driven out of the canal below the urethra, it being mainly at the floor that the tissues are so distensible. The section of the corpus spongiosum is wider below than above; the texture is soft and spongy. The urethra corresponds in distensibility to the soft structure outside, and although the instrument goes smoothly down to this point, it may not enter the membranous portion. Now, take care, at first, to have the point of the instrument so turned up as to avoid this lower part. Nothing is so good as a well-curved instrument to escape that obstacle. I have frequently made the following experiment in the out-patients' ward:—Finding a student who has never passed an instrument before, I say to him, 'Pass this bougie (a straight or slightly curved one) into the canal.' He passes it, and almost invariably, when he arrives at the membranous portion, stops. I then take the same instrument, give its point this form (Fig. 4), and the student immediately succeeds in passing it into the bladder. This is the form which is made prominent in the instrument called 'coudée' by the French, and a very useful one it is. Sir B. Brodie recommended in his lectures the plan of giving a little upward turn to the point of a bougie for the same purpose more than fifty years ago. As the instrument goes in, the point follows closely the roof or upper aspect of the urethra, instead of becoming engaged in the lower and more distensible part of the bulb.

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[1] The urethra should have been shown here as it really is, a closed canal; the line in the bulbous and prostatic portions having been made by me merely a little thicker to mark (*diagrammatically*) position and the character of dilatability. This *line has been somewhat exaggerated* by the artist.

The last obstacle is at the neck of the bladder, and so common is it, that you often hear of 'stricture at the neck of the bladder'—a thing which does not exist. There never was a stricture even in the prostatic portion. 'Stricture at the neck of the bladder' was a household word some years ago, and even now you sometimes hear of it; but there is no such thing. The idea has arisen from the circumstance that in using the catheter, obstruction is sometimes encountered at this spot, and 'stricture' was erroneously assumed to be the cause. When the difficulty occurs, and it may do so in a perfectly healthy urethra at any age, a well-curved or a 'coudée' catheter will almost invariably pass with ease. Let me recapitulate shortly the three sources of difficulty: First, the lacuna magna, which is avoided by following the floor of the canal; then the narrow membranous portion at the bulb, which is avoided by keeping the point of the instrument well up against its roof; and the same management will also succeed with obstruction at the neck of the bladder.

So much for the management of an instrument in the healthy urethra. We now have to learn how to make the physical diagnosis of stricture.

For this purpose there are two separate modes to be followed, as there are two different objects to be attained, each of which is quite distinct from the other:—

There is, first, a simple examination of the urethra, to be used only for the purpose of verifying the presence or absence of any material deviation from the natural dilatability of the urethra.

And there is, secondly, a more minute and exact examination, in order to determine the precise condition of the urethra when it is already known, or there is reason to believe, that long-standing and perhaps considerable obstruction exists.

Now, I need hardly say that the first examination is one which is applicable to the vast majority of cases; and that the second is necessary only in a few and exceptional cases. A very simple examination suffices to determine the question which so frequently comes before us—'Do certain not very considerable derangements of the urinary function in any particular patient arise from organic obstruction, in which case they probably require instrumental interference; or are they due to some other condition, for which instruments are not merely useless but would probably be injurious?'

Now, in considering this subject, I feel compelled to express the opinion that there is a tendency at the present day to employ instruments too readily, and instruments also which are liable to injure the urethra. This over-readiness to interfere with the urethra existed at the beginning of the present century. The mechanical school, as I shall take the liberty to term those who devise and largely employ more or less complex mechanical means for exploration, and for applying dilatation, cutting, or caustic to the urethra, was then in the ascendant. I think I could occupy you for hours with the history of the innumerable surgical knick-knacks which have been produced by it. But our time is too valuable, and I will content myself with one illustration only of surgical practice in this country at the era I speak of.[1]

Following the period spoken of came the experience of mischief as its result, and a certain healthy reaction in opinion appears to have taken place. The practice of Sir Benjamin Brodie, who was subsequently so high an authority during his long career, was marked by caution and prudence, and his admirable teaching ensured a similar practice among others for some time. I may be allowed to say, perhaps, that my feeble voice has also been raised against the abuse of instruments from the first day that I ventured to pen a line on the subject, some five-

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[1] The lecturer then read some curious reported cases from a work of Sir E. Home, illustrating the extraordinary abuse of the bougie at that time. See *Pract.* Observations on the Treatment of Stricture. By Sir E. Home. Vol. III. 1821, chapters x. and xi.

and-twenty years ago. And now I perceive a growing disposition to return to the state of things I have referred to. I note an increased tendency to discover stricture, and especially to undertake a considerable amount of operative treatment for strictures of the slightest kind, and sometimes in cases where, in my opinion, no strictures have existed. There seems now to be a school which has determined for itself a very high standard of patency in what we hear called the 'urethral tube,' and which is accordingly said to have, or, if it hasn't, that it ought to have, a calibre of so many parts, and very large parts, of an inch, or so many millimetres, as the case may be. Instruments of astounding magnitude are produced, and if one of them cannot be passed, with an ease which contents the operator, through the whole of the urethra, the unlucky patient is pronounced to be the subject of stricture; and probably he is submitted to an operation by no means devoid of risk.

Now, I don't know that this fashion has as yet been adopted here, but I do know that it exists elsewhere, and I raise my earnest protest against it. I feel it a matter of duty on my part to say what I think about treatment which I am perfectly certain neither you nor I would for a moment entertain the propriety of in our own proper persons; that is, if we entertain a due respect for the delicate and elaborate structure of the urethra which an intelligent acquaintance with it will ensure. Let us for a moment revert to the natural form which the canal takes when it is distended by some fluid material, and observe how unlike it is to the coarse simile of a tube of known uniform diameter. We have already seen that its natural capability for dilatation varies greatly at different points: being much limited at the junction of the membranous and spongy portions; limited again, but less so, and somewhat irregularly, in the anterior part; and again at or near the meatus. Let me assure you also that there are few structures more complex than those which constitute the male urethra. Formed of an internal membrane of great tenuity, surrounded by elastic and muscular fibres, interpenetrated everywhere with ducts, fine blood-vessels, and nerves; the whole surrounded in front of the prostate with one of the *most elaborate of vascular* structures, known as erectile tissue; it possesses also a sensitiveness to pain, in which quality it is not surpassed even by the conjunctiva; as any one may learn for himself by passing the softest intrument he can find. Finally, and more important still, it possesses another form of sensibility, of a much graver kind, which even the last-named membrane does not possess: I mean a strong tendency to arouse, in the entire nervous system, a state of excitement, evidenced by the striking phenomena of rigors and subsequent fever and prostration, when slight mechanical injury has been done to any portion of it. Now let this picture of the urethra as it is never be absent from your mind's eye when you put an instrument into it, and both you and your patient will profit. When, therefore, a young man consults you for certain troubles relative to which you desire to learn whether urethral obstruction be a cause or not, do not be tempted for an instant to adopt so unnecessary a course (to say the least) as the introduction of very large instruments, or instruments with huge bulbs at the end of them. For sometimes—indeed, not very infrequently—such an applicant is the subject of some chronic inflammation of the prostatic urethra or neck of the bladder after gonorrhœa; and a certain way to make him worse is to pass a large instrument, or, indeed, to pass at this particular juncture an instrument of any size or kind. This is a subject which will be further mentioned in its place. Supposing, however, that you have satisfied yourself on this head, and intend to examine the urethra, simply take a flexible English gum-elastic bougie, slightly curved towards the point, with a blunt end (since a tapering point, of course, will not mark distinctly the site of stricture), not larger, as a rule, than No. 10 or 11 of our scale (*see* Fig. 5), and pass it very gently and slowly into the bladder. If it goes easily—above all, if it is withdrawn without being held, and slides out with perfect facility, take my word for it he has no stricture, and, *quoad* obstruction, wants no use of instruments whatever.

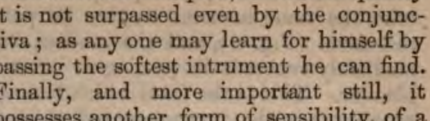

FIG. 5.—Blunt-ended bougie.

I daresay I shall be told by some one that there may be a urethra through which No. 11 can be made to pass, yet which is, nevertheless, the subject of some degree of stricture which it is necessary to treat. Well, I do not deny the existence of that exceptional case. But such an example is very rare, and, further, no man who has the slightest delicacy of tactile sense in his fingers can fail to observe the difference between a No. 11 bougie sliding out with facility, and one which is grasped somewhat as it is withdrawn. This difference is always manifest in the two cases, and is, indeed, very notable. But supposing that the No. 11 stops at any point, and you have assured yourself that it is not one of the natural obstructions to the passage of an instrument through the urethra, of which I have already spoken fully, mark accurately what is the distance, by inch measure, between the point of obstruction and the external meatus. Next pass a smaller instrument of the same kind, which may probably pass a little further; and so on until you have arrived at one which does pass through and inwards into the bladder. But you may also test your observation by passing a soft tapering French bougie —11 or 12 English size—and if it is a *natural* obstacle which at first checked your blunt-pointed bougie, the former instrument will probably slip through without trouble.

Now, with the common exploring instrument which is formed of a long small flexible bougie terminated by a bulb of considerable size, nothing is more easy, especially with an unpractised hand, than to deceive oneself with respect to the existence of stricture. If not drawn out accurately in the axis of the passage, you may feel a check, and readily find what you believe to be a stricture in the most healthy urethra. And that is precisely what I am so anxious to guard you against; for, in the hands of designing persons, these instruments may be turned to most unworthy purpose. For men outside the ranks of our profession, or holding a questionable position on its outskirts, these instruments are the very thing. That is an additional reason why we should be careful not to encourage their unnecessary use. I have for twenty years past used small bulbous instruments in metal for the diagnosis of narrow and confirmed stricture, on which it is desirable to operate, but for slight stricture never; and I have protested against their use on the two grounds already named: first, that for such the instrument inflicts needless pain; secondly, that it is liable to deceive a young operator not too adroit or familiar with its use.

But now, in the second case—not that of the young man, but of the patient who has a confirmed stricture—the diagnosis has probably to be conducted with more attention to detail. I proceed as follows, making what may be called a 'survey' of the passage. I commence by passing the soft, blunt-headed English gum-elastic bougie as far as it will go, and when this stops, as it may do within an inch or less of the orifice, I make a note of the distance; and next taking a smaller bougie of the same kind, find what will pass with tolerable ease through the obstruction met with. Very likely a No. 4 or 5 will do so, and it may then be carried further to seek another check, which is not unfrequently met with at about five inches from the orifice. Through this, after a trial or two, a very small gum catheter—say No. 1 or 2—may probably be passed into the bladder, enabling me to draw off some urine, and so to be assured of its position. I know then that the patient has, at all events, a narrowing near the orifice and another at the distance named. I may verify this at once with a bulbous instrument if I choose; but as long as the anterior narrowing exists, it is as well to postpone more minute research until it is divided, as considerable narrowing at that part always requires to be. Such an one, indeed, is never advantageously treated by dilatation. This being done, the No. 11 blunt-ended bougie is passed, and will detect any contraction affecting the canal anterior to the stricture already observed at five inches from the orifice. If there is one, the stopping of the bougie will indicate its situation. But if the bougie passes easily to the point just named, the canal is sufficiently open, and I have arrived at what, in ninety-nine cases out of a hundred, is the only remaining stricture; for it is rare indeed, where a narrow stricture exists at that distance from the meatus, that any other will be found beyond. This has next to be dealt with, and as we are speaking now of old and confirmed cases, there is little doubt that the best treatment will be internal urethrotomy. How to accomplish that most perfectly will be discussed in my lecture on that subject.

A word or two about the bulbous exploring instrument. It should, in my opinion, be of polished metal mounted on a slender metal rod or shaft, and should be used in several sizes from a bulb of No. 2 up to one of No. 13 or 14 (Fig. 6). No other material slides so easily and smoothly through the urethra; and the necessity for it is, after all, not great, so that to employ one which passes roughly or distends unnecessarily, is to pay too high a price for the small amount of information it may convey. I am free to say that, although I used the metal bulbous instruments in the earlier part of my career, I can now, with more experience, attain all that is necessary without them. It is said that they enable you to ascertain the length of a stricture. In reference to this, let me tell you, first, that considerable narrowing very rarely affects the urethra for any great distance. The passage is often partially implicated for half an inch behind and half an inch before the maximum point of narrowing—an important practical point in relation to operation; but the very narrow spot, which is what the exploring bulb indicates, is almost invariably short, within a quarter of an inch in extent. Secondly, you must take into consideration the fact that the mobility of the mucous lining of the urethra will deceive you if you are not aware of it. A very little pressure in front, on entering the stricture, or from behind, in withdrawing the exploring bulb, if it comes rather tightly through, changes the situation of the contracted portion considerably in relation to its distance from the external meatus.

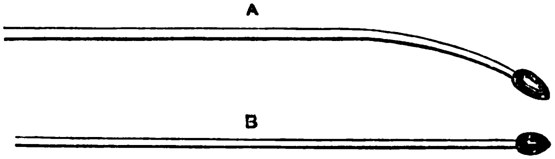

FIG. 6.—Straight and curved metal exploring bulbous instruments.

I repeat, then, if you have to deal with a recent stricture, such an one as you naturally intend to treat by dilatation, the introduction of a large bulbous explorer is wholly useless, only produces unnecessary pain, and tends to excite inflammation.

But in view of any internal incisions for a confirmed or obstinate case, the important thing is simply to know precisely where the narrowed points of the urethra are, and then it is not difficult to apply your cutting instrument properly to them.

The subject of treatment by dilatation will occupy our attention at the next lecture.

LECTURE IV.

THE TREATMENT OF STRICTURE OF THE URETHRA BY DILATATION, SIMPLE AND CONTINUOUS.

HAVING accomplished our diagnosis, we now come to the subject of Treatment.

Supposing a man has but one stricture, and that in the bulbous portion, or if he has two, that the anterior stricture is by no means very narrow or resisting; what are we to propose to do for him?

First and foremost, dilatation—*dilatation always—dilatation* without exception, whenever it will succeed. It is always to be tried first, because it is the safest and easiest mode. If you find a man with a stricture which is very narrow, by no means think of operating until dilatation has first been fairly tried.

What is dilatation? A mechanical process of stretching this organised lymph, which forms bands round the canal at the strictured point. It is often said to produce absorption of this tissue, which I shall not absolutely deny, but only say that there is not the smallest particle of proof to support the notion.

Now, we will suppose a case in which, as the result of your exploration of the urethra, you have been able to pass No. 3 bougie or catheter rather tightly through the stricture and into the bladder, drawing off a little urine, in order to be perfectly sure that all has gone right; you will be able to say to the patient, 'That is enough for to-day; come again in two or three days' time for a larger instrument.' Then on this second occasion I advise you not to commence with the largest instrument previously passed. Having passed, say, Nos. 2 and 3 on the first occasion, you should now take Nos. 2, 3, and 4; and on the third occasion, 3, 4, and 5; and so on; always beginning below the point you had attained on the previous occasion, making the smaller instrument a sort of *avant-coureur* for the larger one. This process is always understood as that of 'Simple Dilatation.'

But further, never let the instrument remain in the urethra; withdraw it at once; leaving it there for a few minutes simply increases irritation, and does not augment in the slightest degree the dilating influence. Thus the longer the bougie remains within the urethra the tighter it is held, and the more difficult and painful it is to withdraw. Not until the instrument has remained in the stricture some hours does this begin to relax, as we shall see by-and-by, in considering 'Continuous Dilatation.'

Now comes the question of the kind of instrument to be employed. The great principle which underlies all mechanical treatment of the urinary organs, whether for stricture or for hypertrophied prostate, for retention of the urine or for stone—the one great principle which must decide for us the question of the kind of instrument to be employed is this:

ALL INSTRUMENTS ARE EVILS, MORE OR LESS CONSIDERABLE, NEVER TO BE RESORTED TO UNLESS A GREATER EVIL BE PRESENT, WHICH THEIR EMPLOYMENT MAY PROBABLY REMEDY.

The passage of an instrument of any kind into the healthy urethra must *per se* be a source of irritation. Try it yourself; and I advise you to do it, if you wish to pass *an instrument* well; for I maintain that no man should pass an instrument for another until he has passed one for himself. Of course the amount of irritation will depend in great part on the manner in which it is passed, and on the kind of instrument employed.

Let us consider that in relation to the case of your patient there is, to use a commercial simile, a 'debit and a credit side' to all your treatment. You intend, beyond all doubt, to effect some real good—which is to be a considerable advance to the 'credit side' of the account; but you cannot do it without producing some slight irritation in order to gain your end—that is an entry on the 'debit side.' Be careful, then, that you constantly bear in mind the latter fact, and make it your business to diminish that 'debit' as much as possible. Do not pass an instrument unless there is some good reason, unless there is some evil, for the sake of curing which it is worth while to incur a little irritation. Acting upon this principle, you will choose such an instrument as you know by experience or otherwise to produce the least possible irritation.

And this leads me to the question of the difference between solid and flexible instruments. Here I feel that I am treading on delicate ground; and I will tell you why. First of all, I was originally, many years ago, an advocate of solid instruments as against soft ones, being influenced by the traditions of this school, which are entirely in favour of the former. I can give you the reason for that. The great master-spirit of this place, who has been dead some twenty years or more, the man who gave the tone to the place, and educated almost all the elder men here—I mean Liston—declared his preference for the solid instrument in very strong terms. It is (1882) just thirty-six years ago since I sat in this room and heard him deliver a lecture on that very subject. His powerful advocacy of the silver instrument, and the contempt he had for others, were matters of notoriety. Starting, then, with such views, and regarding him—as every one does, to a certain extent, the man who teaches him well and fairly what he learns—for a certain time as an oracle, I was strongly in favour of the solid instrument as against the flexible.

But what is much more valuable than any oracle, whoever he may be, is a large personal experience; and this has taught me that, beyond all question, the flexible instrument is the best—if only you know how to use it—for the treatment of stricture, and for all maladies of the canal, whenever it is available. I am so certain of this, that I have no hesitation in saying that a great part of the success of any man who has much to do with such cases will depend upon his using flexible instruments instead of rigid ones. No patient will ever allow a surgeon to pass for him a solid instrument if you have passed for him a flexible one as easily as you may readily do. It gives so much less pain, and produces so much less irritation. To continue my commercial simile—it puts so much less on the 'debit side' of your patient's case, and thus leaves a larger 'credit;' you get so much more of advantage, and so much less of disadvantage. I confess, then, to a considerable change of opinion ever since I published my first work on the subject; and I do this without the slightest shame or the slightest repugnance. I hold that the purpose of life in this world cannot have been achieved by us if we have never changed our opinions. You may rely upon it, with regard to any subject whatever, whether concerning politics or religion, or our own proper profession, if we hold the same opinion at forty years of age as we did at twenty—and, perhaps, looking forward, I may say, if we hold the same opinions at sixty as we do at forty—we live to very little purpose. It is an error to look for a life-long 'consistency' in matters of opinion from men who think for themselves, in whatever department their teaching may be. You must expect them to progress, or they will be bad teachers—just as I hope you are progressing now. I have said this because I know that much might be quoted from what I held five-and-twenty years ago which is inconsistent with what I am now saying. If I did not state this you might ask me why, having said so much in favour of the silver instrument, do I now say so much in favour of the other. You have my reason; it is simply that I have learned better.

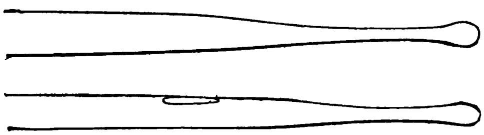

FIG. 7.—Flexible French bougie and catheter, with tapering and bulbous ends.

There are two kinds of flexible instruments, the English and the French. Inasmuch as the French instrument possesses more flexibility than the English, I often prefer it. Perhaps it is right that I should add a word or two to what I have said. I believe the flexible instruments are much better now than they were in Liston's time; and I think that, if he had lived until now, he might have changed his opinion too. This is the kind of flexible instrument chiefly employed in his time. It is called a 'bougie;' and properly, since it is simply a kind of wax-candle, and is, in my opinion, a very imperfect instrument. You can bend it into any form by warming, but it is a very inferior implement to those which are generally used now. Nevertheless, the term bougie is still retained to describe the modern solid instruments, although they possess characters entirely different from the original production just referred to.

The gum-elastic or English flexible instrument is very valuable on account of one quality which it possesses, and which does not belong to the French instrument —*i.e.*, it will preserve any curve, when cooled, which you choose to give to it under the influence of heat. If I wish it to possess a certain curve, I place the instrument in warm water, give it the curve required, then put it in cold water, and the curve is fixed or set.

The French instrument is exceedingly flexible; a quality which is often of great utility. And it has another valuable character—namely, the peculiar form of its tapering point. Now, in passing through the urethra, a tapering point is often undesirable, because it is very liable to get into some lacuna. It is an advantage if you can provide that it does not do so; and this is ensured by constructing a little bulb, at the end (*see* Fig. 7). The long tapering extremity, terminated by the bulb, escapes the lacunæ, and may be passed through the healthy urethra, or through one not much contracted, with great ease. Such an instrument as that may be passed by the patient himself without difficulty. The merest tyro can pass it in nine cases out of ten, although he may not always succeed. It is a remarkable instance of English conservative feeling or prejudice that these instruments are found in so few hands. They are, however, at last being made here. For years it has been necessary to send to Paris for them; but a demand is arising now, and they are at length manufactured in this country. If you will try the experiment on yourselves, you will find that this instrument traverses the urethra almost without producing painful sensation; and no knowledge of the canal is required for the purpose of using it.

Now, it may appear to you very heterodox, but I advise you, in passing an instrument, to forget all about your anatomy. You are taught it at the College, and it is all-important that you should study it thoroughly; but for the purpose of passing an instrument well, you will only be embarrassed by an endeavour to be guided by anatomical knowledge of the different regions. Think nothing about the deep fascia, the membranous portion, or the compressor urethræ.[1] A solid instrument is especially dangerous in the hands of an anatomist; he will push it the way he thinks right, as if all urethras were exactly of the same form, and did not vary as much as noses do, or other features. This used to be the pretext for preferring the solid instrument; it was said, 'You want to know exactly your anatomy, and to pass the instrument accordingly.' I pity the patient who has a solid instrument thrust into his body by a man whose action is guided only by a knowledge of anatomy.

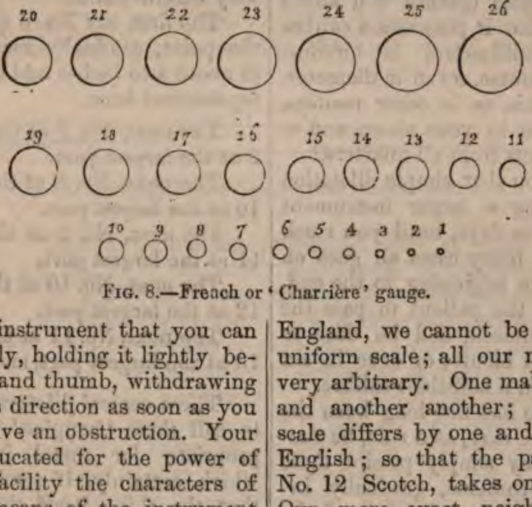

Fig. 8.—French or 'Charrière' gauge.

You require an instrument that you can use most delicately, holding it lightly between the finger and thumb, withdrawing it or changing its direction as soon as you are able to perceive an obstruction. Your hand is to be educated for the power of perceiving with facility the characters of the passage by means of the instrument within it; and rarely, if ever, are you to push a solid instrument in any given direction preconceived to be the right one. If you wish to achieve the maximum amount of dilatation and to produce the minimum amount of irritation, this flexible instrument is unquestionably the one for you to use.

There is one other point to notice with reference to French and English instruments—I mean the gauges. The ordinary range of our number is from 1 to 12: although two or three higher numbers are occasionally used. Here is No. 12; and you generally consider, when you have reached that size, that you have *completed* the dilatation. In England, we cannot be said to have a uniform scale; all our measurements are very arbitrary. One maker has one scale, and another another; and the Scotch scale differs by one and a half from the English; so that the patient who takes No. 12 Scotch, takes only 10½ English. Our more exact neighbours over the Channel use the millimetre, and the number itself expresses the precise size, so that when the number of any instrument which has been used is named, the exact degree of distention produced is recorded (*see* Fig. 8).

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[1] I am not surprised that exception has been taken by some writers to this passage. Notwithstanding which, I never felt the truth of it more strongly than I do to day. No one ought to infer from it that I undervalue anatomy: it is the last thing I should desire to do. But the passing of an instrument well is not in any way an anatomical exercise. It is not an *à priori* proceeding conducted according to a knowledge of anatomical facts, but according to a deduction from large experience of the practice. Even healthy urethras differ considerably; but in exploring the passages, whether healthy or diseased, the hand is to be guided wholly by an intelligent appreciation of sensations communicated by the point of the instrument, and not by anatomical knowledge.

In the French scale also, the sizes are far more numerous than they are in ours. It commences with a smaller instrument and ends with a larger one: besides which, the intermediate stages are more gradual. By permitting only a slight augmentation of size in passing from one number to another, dilatation is rendered more easy, and irritation is avoided. You may pass, for instance, a No. 4 English very easily, and a No. 5 with difficulty, or not at all, while an intermediate size would afford you the means of progress. The French numbers 3 to 21 are about equal to our 1 to 12; which shows how much more gradual the scale is. No. 1 is one millimetre in circumference; No. 2 two millimetres, and so on; so that the increase in size is uniform as well as gradual. If I have a patient whose urethra will admit No. 21, I know that it possesses a calibre of twenty-one millimetres in circumference, and, of course, seven in diameter. I advise you in this, as in other matters, to be cosmopolitan in your views, and to adopt improvements from all quarters.[1]

I have told you that simple dilatation consists in passing a larger instrument every two or three days, until you reach the highest. In many cases all goes on smoothly from the beginning to the end. Then you teach the patient to pass the instrument for himself, and he does so afterwards once a month, or once in six weeks, to maintain a sufficient calibre.

A patient who has not long been the subject of stricture may, as a rule, be successfully treated by simply passing these soft flexible instruments, gradually increasing their calibre until that of the healthy urethra is obtained. But these very qualities of softness and flexibility, which diminish so greatly the disagreeable sensation when passing, and the chance of injury to the patient, constitute them inefficient when you have a case in which the hardness and resistance of the stricture are too great for their somewhat feeble power of penetration. What is the next step? What substitute do you employ? Are you to relinquish the process of dilatation, and think of performing any operation? By no means. You will now resort to firmer and less flexible instruments; and there are few which are more efficient or easy to pass at this stage, than conical steel instruments, which are all the better when silver plated. The sizes which I should recommend you are not to be small—indeed, none smaller than the following, of which I don't know that the first is not too small for any but very careful hands.

The first, say No. 6 (English scale) at the point, gradually increasing to No. 8 at about two inches and a half from it, as represented here.

The next, No. 7 at the point, and No. 9 at the largest part.

The next, No. 8 at the point, and No. 10 at the largest part.

The next, No. 9 at the point, and No. 11 at the largest part.

The next, No. 10 at the point, and No. 12 at the largest part.

The next, No. 11 at the point, and No. 13 at the largest part, and so on to No. 15.

These conical dilators—I scarcely like to call them 'bougies,' a term so inappropriate for metal instruments, and which certainly, if retained at all now that the thing itself, the wax candle of our forefathers, is obsolete, should denote only flexible instruments—may be passed with great ease, owing to their polish and weight; while they can scarcely be surpassed for efficiency in the later stages of dilatation. I recommended them equally thirty years ago, and have in no way changed my mind about them. You should, however, be provided with something intermediate between the very flexible bougie and these metallic dilators; and many means for combining the flexibility of the former as to the point, and the stiffness of the latter as to the stem, have been contrived—such as gum-elastic, flexible metal, &c. In France, a stiffer bougie is produced by constructing

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[1] Taking the sizes employed by the chief London instrument-makers as representing the 'English scale,' I have constructed a table, in which the sizes of the French ('Charrière's') scale from 1 to 24 occupy the upper line, while the sizes of the 'English scale' occupy the under line; so placed that the relation of the two scales may be seen to each other. Note that the numbers do not generally coincide in situation—thus: the English 6 is between 11 and 12 of the French scale, but nearer to the 11 than to the 12, and so on.

Scale of Charrière.	1	2	3	4	5	6	7	8
English Scale.			1			2		3
Scale of Charrière.	9	10	11	12	13	14	15	16
English Scale.	4	5	6		7		8	9
Scale of Charrière.	*17*	18	19	20	21	22	23	24
English Scale.		*10*	*11*		*12*	*13*		*14*

the ordinary black flexible one, with a centre core of soft lead wire, and it is a very useful instrument; but since this lead traverses the entire length, the terminal portion is rendered as firm as the shaft. Of late I have adopted a plan which I prefer to any of these, and for all sizes from No. 4 to No. 8 or 9 (English) it is perhaps better than any. I have had a short and very soft lead stylet made, to be introduced at pleasure into the interior of the French conical bougie, and terminating in a fine point, which stops short about four inches and a half from the end of the bougie. Here is a set of them: six in all. The following diagram will explain what I mean. A section shows the movable lead stylet in the interior, but is represented as extending too close to the end, which should be long and flexible (Fig. 10.) Their maximum diameters are about 5½, 6¼, 7, 7¾, 8½, and 9¼ (English)—a series which may well intervene between the soft bougies and the metallic dilators. Capability to penetrate easily is ensured by the complete flexibility of the point, and the increased firmness of all the rest of the instrument.

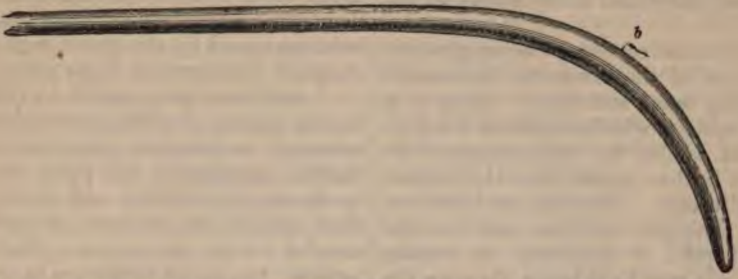

FIG. 9.—Metallic dilators, inappropriately called 'bougies;' *a.* point, *b.* largest part.

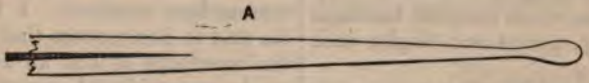

FIG. 10.—Flexible French bougie, with movable lead stylet.

We will now consider 'Continuous Dilatation;' a term which applies to a useful mode of treating stricture by permitting the instrument introduced to remain in the urethra during a considerable period of time. There is a patient upstairs who is now undergoing this process successfully. You have tried, we will suppose, the simple dilatation, and have not made the amount of progress desired; or, perhaps, the patient's avocations may make it necessary to obtain speedy relief. In either case you may say, 'If you can remain ten or fourteen days in your room, not necessarily in bed, but on the sofa quietly at home, I can almost certainly dilate your stricture from the smallest number up to the highest'—by 'continuous dilatation.' In 'simple dilatation' the instrument is merely introduced, and at once withdrawn; in 'continuous,' instruments are tied in, and allowed to remain for several days.

But there are certain rules which it is essential to observe in order to attain our object safely and easily.

I. The catheter is always, if possible, to be one of gum-elastic, and of English make, which is superior for this purpose to the more flexible French, from its greater power to resist the destructive action of the urine. If, on account of the narrowness or tightness of the stricture, a small silver catheter only could at first be introduced, of course it must remain for a day or two until it can be replaced by one of gum elastic.

II. In tying-in the catheter, take care that the end of it only just lies within the cavity of the bladder. An inch or two of catheter there is a source of irritation to the organ, acting, indeed, like a foreign body, as it is. There is no difficulty in accomplishing this object if, the patient being upright, urine is passed though the the instrument. You will observe by drawing it out a little, while the urine flows, at what spot the stream stops; and then reintroducing the instrument a little, you will secure it precisely when it arrives at the spot at which the stream again flows.

III. The catheter is always to be small enough to pass easily, so that even when first introduced it lies loosely in the canal.

These three conditions being granted, this is one of the safest and best modes of treating some strictures. There is a patient upstairs who has finished the process, and to-day the house-surgeon tells me that he has passed No. 11, English scale, with ease. The man has been here only a fortnight, and has now not the slightest pain or frequency of making water. He says he is better than he has been for twenty years, and he came here in an exceedingly bad condition. Having been treated as an out-patient, and making no progress, I advised him to come in, and try continuous dilatation.

I may here show you what I think the best manner of tying-in a catheter. By the old methods, which involved bandages round the body, groins and thighs, each movement of the body exerted some influence on the instrument—an extremely undesirable condition. The object to be attained is a method which permits free movement of the body without influencing, through the medium of the fastenings, the position of the catheter. The most simple and efficient method I can devise is to attach the catheter to the penis and pubic hair by means of soft twine or by 'bobbin,' which is a soft cord made of cotton and not of hemp, and does not irritate the skin. Two separate attachments loosely made in the manner shown at Fig. 11 *render the instrument secure, and permits* alterations in size to occur without causing discomfort. Of course the patient is not allowed to indulge in much movement, and he requires very little in his chambers, or in a ward. But I have known those who have habituated themselves to the use of the catheter in this manner follow their usual avocations for hours, scarcely inconvenienced by the presence of an instrument thus fastened in its place.

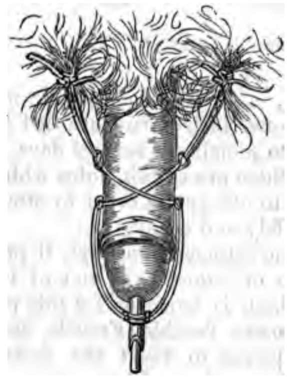

Fig. 11.—Mode of attaching the catheter.

I shall now only repeat in reference to this process that three conditions are necessary to success: you must have a flexible instrument; the point must not be far in the bladder, and above all it must not fill the stricture, because, remember, it is not a mere mechanical process; you do not require, as in ordinary dilatation, to distend the stricture as you might a lady's glove, but to treat it by ensuring the continued presence of a foreign body in the passage. If you leave in only a No. 1 for a sufficient length of time, you will be able, when you take it out to pass No. 10, without using the intermediate numbers. I believe I was the first to demonstrate that curious fact; the knowledge of it at all events reached me by an accidental occurrence in practice. As a rule we do not leave so small an instrument very long in the urethra, because the stream of urine would soon wash it out, and it is desirable to put in a larger one to fill the canal a little more.

If, when it is necessary to introduce a larger instrument, you use one which is quite as large as the stricture will admit, pain and irritation will be produced, and the progress will be less satisfactory. Every time the catheter has to be exchanged for a larger, avoid using one which passes with difficulty, but take an instrument which is at least two numbers less than the size which the stricture will absolutely admit. In continuous dilatation, as well as in simple dilatation, you are to adopt the plan which gives the smallest amount of pain and irritation to the patient, putting as little as possible to the debit side, and as much as possible to the credit. Well, then, having ceased to tie-in any longer—say, at the end of six, eight, or ten days, according to the case—a full calibre having been attained, the instrument should be passed daily for two or three days. Then gradually increase the intervals of time, maintaining as much of the dilatation gained as you fairly can. Most commonly two or three numbers are lost reckoning from the highest point attained by tying-in: thus, if No. 12 was so reached, you may perhaps maintain No. 9 or 10; an excellent calibre for a patient who commenced with No. 1, and that passed not without difficulty.

It is quite common to observe that the patient has a little fever during the process, but it is rarely considerable. A single rigor, followed by heat and sweating, is not a sufficient reason for suspending the process; and it sometimes occurs after the tying-in has ceased altogether, and during the first or second subsequent day, when the patient commences to pass water without the instrument. When long-standing organic disease of the ureter and kidney exists, as the result of old and narrow stricture, then continuous dilatation may provoke severe and dangerous attacks; but this is a condition in which all mechanical interference is hazardous.

Supposing, however, that the treatment has been well supported, and that no such symptoms have appeared, the result of dilatation may nevertheless appear to be only temporary. As a rule, I have observed that the slower the process by which dilatation is accomplished through the continuous process, the more certainly and rapidly will the contraction reappear. On the contrary, if improvement is very rapidly attained, the result will be comparatively more lasting.

There are therefore some cases in which all the advantages gained by the process are speedily lost. Clearly, some other method than dilatation of any kind will be required for these. This subject, which embraces the operative proceedings to be applied to the treatment of stricture, I shall consider in the next two lectures.

LECTURE V.

ON THE TREATMENT OF CASES OF STRICTURE IN WHICH EXTREME DIFFICULTIES EXIST.

You may remember, gentlemen, that at the last lecture we considered the treatment of stricture by 'ordinary dilatation' and by 'continuous dilatation.' You understand from the nature of the treatment itself that it was taken for granted that an instrument had been passed *into the bladder*. It is, of course, assumed that in treating a case by means of dilatation, whether continuous or simple, the instrument has passed completely through the stricture, otherwise the stricture is not dilated.

But all cases of stricture are not so easily disposed of. It often happens that at the first, second, or even third trial the instrument does not enter, or is not passed through the obstructed part; or it leaves the canal altogether and goes into a false passage. At all events, the instrument does not go through the stricture, and onwards, as it should do, into the bladder. And here I may remark that you are never to feel assured that the stricture has been successfully traversed by an instrument unless it has arrived in the bladder. No test *is so complete* as the appearance of some urine through the instrument passed, which must therefore for this purpose be hollow—in other words, a catheter. Of course if a bougie is employed the test proposed is impossible, and some uncertainty as to what has been done is inevitable.

Here, then, is a condition of difficulty which opens a new subject for us to-day. We have now to deal with more difficult cases, those in which all your care, and all your experience too, if you have any, are needed. It was said by Liston, that 'the operation of introducing a catheter through what has been called an impermeable stricture, is without doubt the most difficult in the whole range of surgical operations, and demands all the prudence, science, and skill of a master.'[1] That statement is in the latest edition of his work, and you can scarcely have a higher authority for the fact there mentioned.

Now, there is one term employed in the foregoing quotation which is often used to describe stricture, to which I take a great objection, and I think the sooner it is expunged from the vocabulary of surgery the better. Such a stricture as that of which I now speak is often said to be 'impermeable,' or 'impassable.'

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[1] Practical Surgery. By Robert Liston. Fourth ed., p. 476. London: Churchill, 1846.

What is impermeable stricture? Well, first, since some urine passes through every stricture thus denoted, it is very clear that 'impermeability' cannot be held to describe a character, a physical quality, of the stricture itself, but rather indicates the quality of the surgeon who has treated it! For, you see, a stricture may be 'impermeable' as regards A, but not 'impermeable' as regards B, who may have passed an instrument fairly through it. But, secondly, 'impermeable stricture' is a contradiction in terms. Stricture is a *narrowing* of the canal; it is not an obliteration of it, which is quite another thing. There must be an opening, and if there be an opening there must be room for an instrument; it cannot be 'impermeable.' It is only a question of the size of that instrument, and of skill or patience in the management of it. The stricture, as I have said, always admits urine, more or less in quantity, to pass through it, and I maintain the truth of the axiom first enunciated by Professor Syme, that whenever urine passes outwards through a stricture, an instrument ought with care and perseverance to be got in. I advise you to believe in that doctrine, not that it is true as regards yourselves at the present moment, for I will assume that you have not sufficient experience to enable you to pass an instrument through a stricture in all cases. If you are able to do so, I can only say that you are quite out of place here, and need not come to learn. Without doubt it is exceedingly difficult to pass an instrument in some exceptional cases, but after a considerable amount of experience you will find that there are very few in which it cannot be accomplished. When you have a really difficult case of stricture before you, the success of your treatment will be materially influenced by the belief that it is your own fault if you do not succeed, or, on the other hand, by your adhesion to the dogma that there are a certain number of cases which must be 'impermeable' to all surgeons. The man who holds the latter belief will be quite certain in some cases not to succeed, whereas, robably, the man who believes that in all ses an instrument may be passed with time and patience will be very likely to succeed in all, and at all events he will succeed better than the other.

'Impermeable' stricture is not heard of so much now as it was twenty years ago. That such a form of obstruction might frequently be met with was generally recognised then, and a particular kind of operation to relieve it was often to be seen in the hospitals; but I will undertake to say that it is much less commonly performed now. The operation consisted in passing a large instrument down to the stricture, and opening the urethra upon it from the perineum, and then carefully dissecting through the obstruction, or by it in some way, if the operator could, into the urethra beyond, and it was not usually a very successful proceeding. It was acknowledged by all authorities at that time as an operation for impermeable stricture, or as 'perineal section.'[1] I have had occasion to perform it three times only in my life; two of these being instances of traumatic stricture, and I believe the necessity for it to be excessively rare. I have already given Professor Syme credit for having first enunciated the doctrine that all strictures are permeable to instruments, and he always stoutly maintained it, without doubt to the great advantage of patients who suffer from severe stricture.

But you may have complete obliteration of the urethra, which, as before said, is not stricture. This is very rare; but it occasionally happens, and chiefly after injury in the perineum, as by the breaking of a vessel, or any wound there cutting into or across the urethra. If the opening remains pervious, and gives exit to all the urine, a cicatrix occurs involving the anterior opening of the divided urethra, which is then closed altogether, and so the canal is obliterated in front of the fistula.

I have now to consider the question, How are you to deal with a case in which real difficulty exists in passing an instrument into the bladder? Let a case be supposed in which attempts have been already made, perhaps by others, and hitherto without success.

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[1] I limit the employment of the term 'perineal section' to the operation when *no guide has been passed* through the stricture. When a stricture is divided by incision through the perineum, upon a guide previously passed into the bladder, it is better, in order to distinguish this operation from the previous one, to speak of it as 'External Urethrotomy,' or as 'Syme's' operation. For brief sketch of both, see pp. 35-6.

First let me point out in what the chief mechanical difficulties in such a case might consist.

There are four.

1. Extreme narrowness of the stricture.

2. The stricture may be tortuous.

3. It may be complicated with false passages.

4. The urethra behind the stricture may be irregularly dilated and reticulated.

Sources of difficulty of another kind, not mechanical, also exist, and are two in number, hereafter to be considered.

1. The stricture may be very resilient, and liable to become rapidly narrower after full dilatation, and even to produce absolute retention on any instrumental contact; and

2. Any use of the instrument may produce in the patient an attack of rigors.

1. Let us consider the mechanical causes of difficulty; of which the first is extreme narrowness.

In regard to this, the first thing you must do is to see the patient make water. The failures to pass the instrument may not necessarily have arisen from narrowing of the urethra, or from tortuosity: there may be a false passage leading out of the canal. It may indeed be that the urethra is altogether free from stricture. No greater mistakes are made than those which occur with patients who have little or no stricture, either from the medical attendant not being familiar with the use of instruments, or from the presence of a false passage into which the instrument enters, so that it fails to reach the bladder. You are first, then, to see the stream of water, perhaps on more than one occasion, so as to estimate it fairly, and judge by it what sort of instrument is to be used. And always let the instrument correspond in size with that of the stream which you see. The instrument should correspond only in this way, however—it should be a little smaller than the stream. You, know, of course, that when a current of water passes into a narrower passage than that in which it has been flowing, the stream is more rapid than before, and when the passage becomes larger it flows slowly again; so that the size of the stream as it flows from the orifice is not to be taken as the precise measure of the calibre of the narrowest part of the canal. You should, therefore, select an instrument somewhat smaller than the stream. There is a patient in No. 10 ward, whom some of you have seen, who does not pass a stream at all; the urine issues only by drops, a result due to the first cause mentioned—namely, extreme narrowness of the stricture. How very small, then must the instrument be which is to traverse that channel successfully!

The first step to be taken with such a case, after having ascertained, as I assume to have been done, the situation of the stricture (see page 19), is to introduce very gently the smallest English gum catheter without a stylet, and try to insinuate it through the obstruction. For this purpose I have endeavoured to obtain some exceedingly small instruments, much smaller than any hitherto made.[1] This tiny catheter which I show you, capable only of containing a slender steel thread rather than a stylet, may be used either with or without it. The value of this little instrument after its extreme tenuity, is its ability to transmit a drop of urine through its interior, and so assure you of its position when the bladder has been reached; an assurance, I need hardly tell you, of great importance. It is worth while making a careful and somewhat prolonged trial, and if you succeed, the instrument is to be tied-in at once, and the route secured—and it is a great triumph to succeed on such safe and easy terms.

But supposing we have been unable to pass the slender gum catheter, we should now adopt a different system of attack, and employ an instrument, still extremely small but inflexible, a small silver catheter which, unlike the flexible instrument, can be guided altogether by the hand. At the same time it is most important to remember, in connection with all small metal instruments, that no more dangerous weapon can be introduced than one of these, unless great care, delicacy, and gentleness are exercised; indeed, it is impossible to be too careful in employing so small a catheter as this is (Fig. 13). You see how easy it must be with such an instrument to enter one of the lacunæ, or into any false passage, or to penetrate the soft walls of the urethra, and even far among the tissues outside. You are never to hold this slender catheter with a tight hand. You must not hold this as if resolved to carry it through any obstruction; but it must be held so lightly that if it meets any undue resistance it will slip through the fingers rather than by any possibility wound the urethra. I certainly cannot advise you to try such an instrument until you have had some fair amount of practice with a larger one. In cases of very great difficulty, a small gum instrument is by no means always successful; but, as I have said, it should always be thoroughly tried at first. Understand that I have been advocating flexible instruments as the rule; but if you fail to pass them after one or two trials, in dealing with a very tight stricture, you must then resort to a small silver instrument.

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[1] Messrs. Weiss & Son have taken great pains to accomplish this for me, and have produced some slender, delicate instruments, much smaller than No. 1, which have been of great service. (See Fig. 12, next page.)

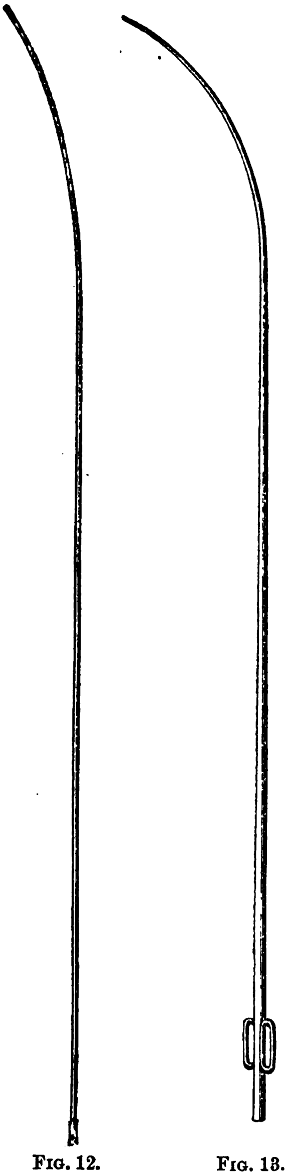


FIG. 12. FIG. 13.

12.—Extremely small gum catheter.
13.—Silver catheter, fine at point, shaft increasing in size to afford stability.

Now, one word upon the subject of using force. *Under no circumstances whatever should force be used in the introduction of an instrument through a stricture or into the bladder.* That is the invariable rule for myself, and my counsel to you. Not so many years ago it was a matter of discussion how much force should be employed; at a more remote period, many surgeons regarded the use of instruments with considerable violence as legitimate practice. Now I am perfectly satisfied, and I believe all experienced men of our day will tell you, that no force is to be employed. It is very difficult to say what one means by force; but what you are to understand is, that no kind of weight or pressure is to be put on the instrument which can by any possibility carry it out of the canal; and very little force will do that. *The more difficult the stricture the less are you to dream of using force.* You will remember that the urethra is possibly of full size up to the point of narrowing, and hence it may be very difficult to find the opening. If you use force, you will perhaps perforate the soft walls on either side, and this done, the difficulty is greatly increased; because, if you have made a false passage, the point of the instrument is much more likely to be caught in it than to pass through the strictured part.

I may here observe that in using silver catheters of small size an injection of oil is sometimes serviceable. Instead of oiling the instrument, commence by slowly introducing from two or three to six or eight drachms of olive oil into the urethra, holding the meatus closely round the syringe. It is easy to insinuate that quantity through a very narrow stricture. The surfaces are lubricated, and sometimes the urethra is slightly distended with the oil, so that, if you can cleverly retain it with the finger and thumb, you may introduce the instrument when you have been unable to do so in any other way. The plan is not to be tried when there is much bleeding, or the tissues are torn.

2. A stricture may be more or less tortuous.

The narrow channel of the stricture does not necessarily follow the original and undeviating line of the healthy urethra. In other words, it may be a little on this side of the urethral axis or on that, not necessarily in the middle. You may see this sometimes in a dead body; and you may infer it from experience on the living. When you have to deal either with a very narrow or with a tortuous stricture, there are two quite distinct systems of using an instrument, either of which you may employ. What I have to say then applies to the manipulation necessary in all cases of difficulty under the present and preceding heads; and I have reserved it, therefore, until now.

First, the little instrument employed, whatever its nature, may be applied in a manner which may be called 'groping;' that is, by carrying the point in any and every direction, with the utmost care of course, until by chance it has entered into the stricture, as you may learn by the sensation of the point being 'held' or 'grasped.' For this purpose very slender solid instruments are made, of gum-elastic, of catgut, covered or not with gum, and of whalebone, since all of these can be produced of rather smaller size than the hollow instruments which I have just described. In order to add to the chance, as is supposed, of finding the orifice, there are some of the first-named material, the ends of which are formed somewhat into the shape of a corkscrew, or are otherwise made to deviate from a straight line. All these are of French design and workmanship; but none have the advantage of the channel, being hollow so as to be capable of demonstrating their presence in the bladder when they arrive there. (See Fig. 14.)

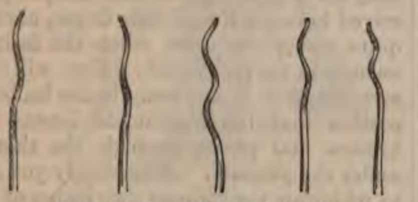


FIG. 14.—Small twisted bougies.

Now, I advise you not to rely much on mere 'groping' to find the orifice; it is exceedingly dull, mechanical work to be constantly groping for a long time.

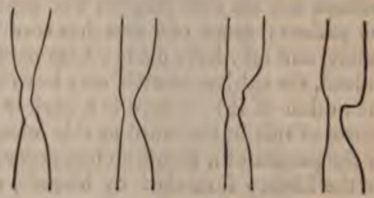


FIG. 15.—Diagrams of stricture.

There is a method of search, however, which is conducted on a fixed principle, and this I much prefer, and always employ. I advise you to adopt that, or any other you can devise, provided that it be a systematic one, and also an exhaustive manner of making the necessary exploration and research for the orifice of the stricture. Some of you have seen me apply it to a patient in the wards to-day. According to this manner, you proceed on a recognised principle and examine each side of the urethra in its turn. We will suppose the urethra for our purpose to have four sides or aspects which require examination—a roof, a floor, a right side, and a left side, all of which are more or less irregular and require to be traversed with the utmost care. You will lightly hold your slender silver catheter and delicately slide its point along one aspect first, say the upper or roof, from near to its commencement at the external meatus slowly down to the obstructed spot and explore this carefully before you repeat the process on another aspect. If the orifice of the stricture is not *exactly* in the middle line—and we may fairly believe that it rarely is so—then there is one side of the passage which will more easily lead into the narrow way than another. These diagrams will show what I mean. (Fig. 15.) If the instrument is slipped on this side (indicating the irregular side on the diagram) it will probably not pass through the stricture, but if the opposite side is followed the instrument has obviously a better chance of succeeding, because you see there is less obstruction on that side. Begin, then, by the roof. The roof is naturally the firmest part, the least likely to furnish obstruction in the way of ducts and lacunæ, and, by following it, you will be most likely to carry the point in. The on the contrary, is the softest, loosest, and most spongy part; and will be most likely to yield to the instrument, and give way. If your first effort does not succeed, take the right side; if that fails, take the left; if that does not do, try the floor. I know no other method so calculated to help you through a difficult stricture. If you are very careful, you may make the attempt in this manner for thirty or forty minutes without doing any damage; but if the patient suffers much, or bleeds rather freely, or if you are losing patience, give up the task, for, under these conditions, a false passage is easily made, and the difficulty may be considerably increased.

3. The existence of false passage leading out of the urethra is another serious obstacle to the introduction of instruments into the bladder.

Suppose a case under your care, in which you have reason to believe that false passage exists. I will assume, of course, that you have not made it—you have been too careful for that—you are perhaps not the first surgeon who has seen the patient; some one else has seen him before, and may have made a false passage. Indeed, the subject himself may have been the author of it! There is a curious instance of this in the ward at this moment, in the person of a man who has, according to the history furnished by himself, used instruments habitually and succeeded in forcing one completely into the rectum! He has used a No. 9 or 10 catheter, and, without proper advice or supervision, has treated himself for stricture. He is certainly an illustration of the old adage, sometimes, but not always, true, that 'he who treats himself has a fool for his patient.' By using extreme violence he has actually thrust the instrument out of the urethra through all the tissues between it and the rectum. When he was in the out-patient room he simply complained that when he passed the catheter into the bladder he sometimes found fæcal matter in the eye of the catheter. The truth is he never succeeded in arriving at the bladder. I suspected the cause, and, after examining him, verified the condition described. Having, as you know, made two prolonged attempts, I carried a No. 1 silver catheter into the bladder to-day. You can easily conceive how difficult such a false passage may make the task of passing the instrument, since he really had also a very narrow stricture.

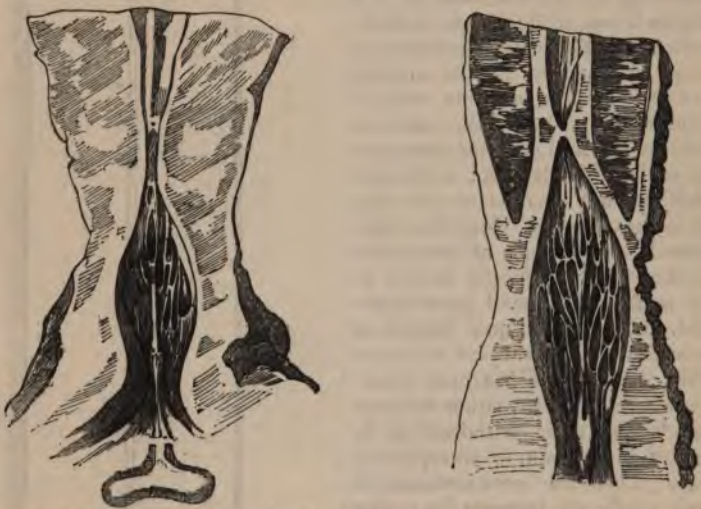
The principle which must guide our action in such circumstances is to be very careful to avoid the side on which the false passage is. A false passage commences usually on the floor, and, no doubt for a reason already mentioned—viz., the fact of the strictures below being looser and more delicate than those above.

When any patient has a false passage, a catheter introduced may pass with facility up to its very orifice and yet give issue to no urine. Hence has arisen the false notion that stricture may exist at the neck of the bladder. When the instrument has thus passed, a finger placed in the rectum will determine instantly whether or no there is a false passage; for, if there be one, the coats of the bowel only, which are very thin, intervene between the finger and the instrument, so that you feel it very distinctly; and very commonly also that it is not in the middle line, but rather to the right or to the left. But if the instrument is in the right passage, the whole thickness of the prostate, not always very considerable, is perceived between it and your finger, always quite enough to show when the instrument is in the right path. You will remember that it is chiefly in the bulbous portion that the instrument leaves the urethra and passes through the tissues under the prostate. Accordingly you are to withdraw the catheter two inches or so, and then to pass it on again, keeping it as close along the upper part of the urethra as possible, ascertaining by means of the finger in the bowel that the instrument is not entering the old route. It will be very likely to do so, because it is much more easy to pass into a false passage than into the right one.

But when false passage exists, it sometimes constitutes the chief obstacle to the introduction of an instrument, for, as I have before hinted, the stricture itself may be only inconsiderable. The size of the stream will help to determine this point; and if, so far from being a mere thread, it has a volume equal to a No. 6 or 7 catheter, use a No. 5 silver one, the rigidity of which enables you to guide it, and try each side of the urethra successively, until you discover which it is that enables you to avoid the orifice of the false passage. Remember the result, and you have a key to the difficulty which will enable you to overcome it with ease on the next occasion.

To these hints about manipulation I have only to add my advice that you should never lose an opportunity, wherever you find one, of examining hospital patients by urethra and by rectum, since practice is absolutely essential to instruct and cultivate your hand. You will often find a case of false passage in the wards, and I wish you sometimes to verify the position of the catheter when it is in the false passage; to observe, by introducing into the rectum your finger, how very little tissue there is between it and the instrument. On the other hand, when it is properly passed, you feel the thickness of the prostate intervening. You can only appreciate this by the touch, and will learn little more by talking of it.

In connection with the treatment of a case of very narrow and difficult stricture, let me say very briefly that if the patient is kept at rest in bed for a few days, his diet regulated, with attention to the digestive functions and to the action of the bowels, the chances of success at the subsequent application of the instrument will be increased. If possible, a few days' rest should elapse after much instrumental treatment by others, or by yourself, if you have already made several trials and have failed, or if, after one trial only, the symptoms have been aggravated. You will make your next attempt under more favourable conditions, if you choose a moment when the animal functions generally are well performed, and the signs of local irritation have diminished.



FIGS. 16 and 17.—Sections of urethra, showing very narrow stricture, and dilated and reticulated membranous and prostatic portions behind it.

4. Difficulty presented by dilatation and reticulation of the urethra behind the stricture.

Suppose next that, following these hints, you have carried the instrument fairly through the stricture, you will be conscious of a hold or grasp of it by the contracted part, which is quite unmistakable. That is a sensation which you are always very glad to have, because, feeling the catheter 'held' by the stricture, you know the instrument has passed well into or even through it. But that very 'grasp,' which you are so satisfied to feel, makes it less easy to manipulate the point of the catheter beyond the stricture, and you may have a source of danger to encounter in the urethra beyond. Thus, the mucous membrane being sometimes reticulated from the presence of dilated lacunæ, the point of the instrument is liable to be engaged in one of those, and make a false passage. Besides these, it sometimes happens, as the result of long-continued fluid pressure and straining, that the whole urethra behind the stricture is much dilated, and that its surface is so irregular, that extreme care is necessary in order to traverse it safely. Here, especially with a small instrument already grasped, you require all the caution you can command to carry it safely onward into the bladder. I show you two drawings taken from cases which exactly illustrate this condition. (Figs. 16 and 17.)

Let us pursue the case one step further. Suppose you have introduced the catheter safely at last, and after much difficulty. By no means withdraw it. You will naturally conclude that, after so much risk and trouble, it will be prudent to maintain the advantage gained by fastening the instrument securely in its place. In these circumstances it is most desirable to do so, even although it is a metal instrument; and you may allow it to remain forty-eight or seventy-two hours before removing it. Do not then be in a hurry to take it out, if the patient is tolerably comfortable. You will be excessively disappointed if you are unable to pass another in its place—a probable event if the catheter is removed too soon—and are compelled to wait until you can attempt a repetition of the difficult task; a circumstance which would also be no less disagreeable to the patient. Keep the original catheter in the bladder at least three days, and then you will mostly be able to change it easily for a small gum-elastic instrument. After all, it may happen at such a crisis, even to a surgeon of experience, that although he has once introduced a small instrument, either catheter or bougie, he is, after withdrawing it, unable to put it in again, or to replace it by another. There are some instances in which such a difficulty becomes the source of serious delay and anxiety. Under these circumstances a little apparatus made on the following plan has been long found extremely useful (*see* Fig. 18). A very fine flexible bougie or catheter with a small socket for a screw at one end (A)—to which a stiff rod of similar calibre, and about 12 inches long (B), can be attached—is employed, and when the small instrument has once been passed, the rod is screwed on, and over it a small gum-elastic tube (C) may be slipped into the bladder and fastened there, when the rod and small instrument are withdrawn. On the next occasion of changing the instrument, the rod and small instrument attached are first passed into the bladder through the tube, which is then withdrawn and replaced by a larger one slipped over the rod which secures the route as before, and is itself again withdrawn.

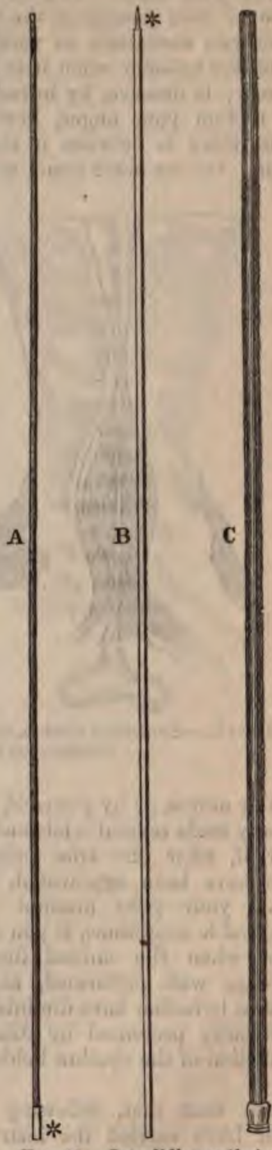


FIG. 18.—Oversliding catheters.

From this point it will be easy to proceed by '*continuous' dilatation*, as already described, increasing the size of the gum catheter from time to time. Having retained an inlying catheter, say the size of No. 10, you may rightly tell your patient that this is a great achievement, that you will speedily relieve him from confinement, and only pass an instrument day by day. This is what will happen in the majority of cases; the treatment having been successful. But not in all, for it may happen in a week or ten days afterwards, perhaps, although this is a rare occurrence, that the stricture will admit nothing larger than No. 2 or No. 3.

Such a contingency presents a special form of difficulty encountered in the treatment of stricture, one not of a mechanical kind, but consisting in a certain organic quality of the obstruction itself, which may be termed 'resiliency,' or strongly marked contractility. Still less of mechanical origin is a tendency in the patient to experience rigors on attempts to treat the stricture by dilating instruments of any kind.

I. What is to be done in relation first to the case which has been here termed the 'Resilient Stricture'?

I will just premise that I desire you to understand that you may have to deal with a very narrow stricture, and be able to dilate it, and the dilatation shall be fairly permanent. On the other hand, you may have a stricture which will admit even No. 5 or No. 6 catheter easily, yet the man will scarcely make a drop of water, and however carefully you may attempt to dilate, the advance will not amount to more than one or two numbers of the scale. We had an instance of this condition in the ward the other day. Although a No. 6 instrument could be passed, the patient was unable to pass any urine by his own efforts until I had performed urethrotomy, and then he was able to do so with ease and comfort.

Let me add, that the successful treatment of this form of the disease is a problem of very ancient date. These resilient strictures have been the plague of surgeons from time immemorial. If you go back to the old records of surgery—some hundreds of years—you will find that these cases have taxed the resources of surgeons down to the present day. All kinds of things have been used in order to overcome the difficulty. I cannot tell you one-half of the various matters which have been put into the human urethra, for the purpose of curing it. I suppose the human stomach has been made to receive more abominable things than any other receptacle in or out of the human body. But if you consult the old surgical authors, or even some modern works, you will see that the urethra has been used nearly as roughly, and that is saying a good deal. Mercury of course, first; then verdigris, savin and other vegetable irritants, metallic salts in all their variety—in short, everything that has the faculty to inflame, or that could be imagined to be disagreeable, has been employed to cure the unfortunate possessors of these resilient strictures. At the present moment I need not tell you that some surgeons have been in the habit of applying nitrate of silver and caustic potash—not at all mild remedies, either of them. Now, the whole question of chemical irritants, as related to the treatment of stricture, I shall dismiss with the following words: I believe them to be unnecessary, undesirable, and often injurious. Most modern surgeons, both in this country and abroad, have pronounced against the use of caustics and chemical irritants in the treatment of stricture. I am bound to tell you they have still some advocates: what system has not? I shall not pursue that question further.

Then what have we left? Several other methods, all of which are mechanical in their nature: we may rupture, or over-extend, or cut these unyielding and contractile fibres, which constitute the stricture. Urethrotomy, as it is called—that is, division of the strictured urethra by some form of knife—is, perhaps, all things considered, the most universally employed in such cases. Now there are two kinds of urethrotomy—external urethrotomy and internal urethrotomy: the external applied through an incision commencing from the perineum; the internal by means of some instrument introduced and applied within the urethra.

Internal urethrotomy, however, is a large subject, requiring much consideration, and will occupy a lecture by itself. Accordingly I will go on to speak of external urethrotomy and of other mechanical applications alluded to.

External urethrotomy has been performed in various ways, and has been recognised as a surgical operation during more than 200 years. Our own Wiseman in the 17th century describes his method: the French surgeons of the same period have recorded theirs. The operations now sometimes performed are two in number; one for division of a non-dilatable stricture through which an instrument can be passed, and known as Syme's operation: the other an operation already referred to, adopted only when no instrument can be passed, for the purpose of uniting the urethra before the stricture to the urethra behind, and so establishing continuity of the canal; this is known as 'perineal section.' In performing it, patient should be secured in the position for lithotomy, facing a good light; a solid metal sound is passed down to the stricture, where, of course, it stops. An incision is then made from the external surface, usually the anterior part of the perineum, upon the point of the staff, so as to expose it freely, and with it, the anterior face of the stricture. It is through the minute orifice now found there, that you will endeavour to dissect by means of fine probes, and lay open the narrowed channel—generally not very long—until you reach the healthy urethra behind the stricture, and so restore continuity of the channel throughout. This being fairly done, a full-sized gum catheter is tied in for two or three days, after which it is withdrawn, and a bougie is to be simply passed every two or three days, and the wound encouraged to heal. Mr. Wheelhouse, of Leeds, has designed and employed a special staff for this operation, which I cannot here describe, but which facilitates the proceeding, and should always be used, as these cases are sometimes very difficult to deal with, and are always more or less so, if the operation is necessary.

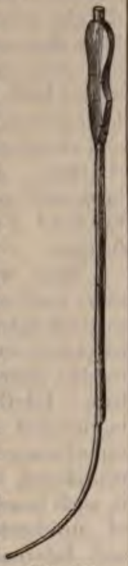


FIG. 19.
Syme's staff for external division.

In Syme's operation, a small grooved staff with a shoulder to rest against the face of the stricture (*see* Fig. 19) is passed into the bladder, incision made in the median line of the perineum, and the stricture freely divided on the staff. There should be a small channel through the staff from the groove, to permit a little urine to pass and show that the instrument has reached the bladder. When the operation is completed the staff is withdrawn, and a flexible catheter of full size is passed through the entire urethra into the bladder and kept there two or three days. It is then removed and a large bougie is to be passed every few days. This proceeding is seldom adopted now, although much done twelve or fifteen years ago; but other means have superseded it. It is usual now to reserve it chiefly for cases in which there are old *or large perineal fistulæ* which may be advantageously laid open at the same time.

We next come to the mode by 'rupture;' and here I will show you an instrument which bears the name of Mr. Holt, of the Westminster Hospital. He has brought the instrument into notice, and the mode of using it is his own. It was invented by M. Perrève, of Paris, about thirty years ago (Fig. 20). He used it mainly, but not altogether, for simple dilatation; Mr. Holt uses it otherwise. He carries it through the stricture, and then, instead of passing at different times a succession of tubes of gradually increasing calibre, he takes the largest tube at once, and forces it down the urethra along the central guide, so as at one stroke to split everything that happens to obstruct the passage of the instrument. Mr. Holt does not tie in an instrument afterwards. When the operation was first introduced, I was strongly repelled by the violence of the proceeding; but I examined some of Mr. Holt's cases with him at the Westminster Hospital — now some twenty years ago—and was surprised to find that so rough a procedure was not commonly attended with any great pain or severe constitutional disturbance. Hence I tried the plan, and used it occasionally for a urethra which had some two or three contracted points, so as to deal with them all with certainty. Further experience has, however, shown that it is by no means without risk, and that the relief afforded by it is often of very brief duration, an objection of a very serious character against any proceeding which, if necessary at all, is so only in the most intractable examples of the

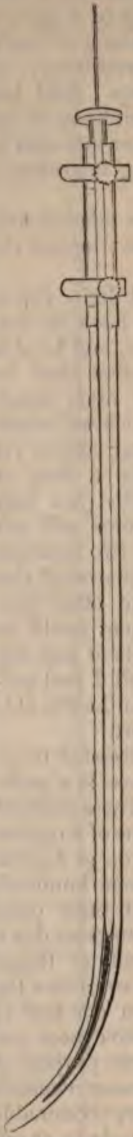


FIG. 20.
Perrève's dilator, from his treatise. Paris, 1857.

disease. The impossibility also of applying the distending force to any portion of the urethra in particular, since the same amount of distention affects equally the whole when it is used, suggested to me some years ago a different method—namely, one which I have called 'over-distending' the stricture. It is simply this. Here are two blades, as in the instrument used by Mr. Holt, but these two blades can be separated for a considerable interval at one point only, and as slowly or as quickly as you please. I have not used it of late years, but when I did use it, the power, whether applied rapidly or slowly, was exerted only on that part of the canal in which the stricture was situated. For there is this fact to be noted: I wish you to remember that the bulbous part of the urethra—the usual position of stricture—is also the most distensible part in the natural condition of the canal. Supposing the external meatus to be about No. 12 (English scale) in calibre, the bulbous urethra admits at least No. 20 or 24. Hence it follows that no kind of dilatation or operation which is limited in extent by the size of the external meatus, more than half restores to its natural size the urethra which has a stricture at the bulb. It is on this account that I distend the contracted part to at least this, or even to a larger size, or rupture it if I please, by means of the instrument in question. I have used it many times, and it has been certainly attended with fair results. It may be suitable especially for a patient who has a strong objection to a cutting operation. But let it be remarked, that this instrument is to be used only for strictures situated within the bulb. I have heard that it has been employed for those within three inches of the meatus: it is a mistake to use it for such, which, as I said before, ought to be treated by complete division—that is, by internal urethrotomy. The operation with the distending instrument requires much more care in the performance than does the proceeding by rupture, which requires neither skill nor caution when the instrument has been properly placed. In performing the operation of rupture, if the tube is properly introduced, a single impulse of the hand forces the tube through; and on that account it certainly presents a tempting facility in performance to the operator. I am not at all certain, however, that it is an advantage to the patient that an operation should be so easily applicable by an inexperienced practitioner. The consequence has been, and not so very seldom, that this proceeding has been performed, owing to such inexperience, on patients for whom no operation of any kind was ever necessary. But what is much more important in regard of these methods by rupture and over-distention, is, that by neither of them is so long a period of freedom from recontraction to be anticipated as that which usually follows internal urethrotomy, when well performed. No doubt the latter procedure is much more difficult to accomplish, and, without doubt, it requires, like most important surgical operations, a practised hand.

II. A few words before closing, on the strong proclivity to rigors which occurs in connection with stricture in certain constitutions. Examples of this class are generally found among cases of old standing disease, although there are some exceptions to this general rule. Sometimes the attacks are due to recurrence of fever of malarious origin which the patient has previously caught in the tropics or elsewhere; and, occasionally, the attacks cease to be induced by instrumental treatment of the stricture, after a course of careful attention to diet and regimen. But for the most part, these cases are best treated by a cutting operation, which often occasions less disturbance to the system than a few attempts by simple dilatation. For it has fallen to my lot on several occasions to observe that a patient who may rarely be able to have an instrument passed of sufficient size to dilate, however gently, his stricture without incurring an attack of rigors and fever soon afterwards, has his stricture completely divided without any constitutional disturbance whatever. An incomplete division may, on the other hand, arouse an attack; but let the incision include the whole of the diseased tissue, so that a large instrument can be passed with perfect freedom, and no subsequent attack occurs. The question of treatment for this class, no less than that for 'resilient' strictures, leads the way naturally to a study of internal urethrotomy. The consideration of this I leave therefore to our next meeting, which we shall devote entirely to the subject.

LECTURE VI.

ON INTERNAL URETHROTOMY.

Gentlemen,—During the last few months many cases of stricture of the urethra have come under our notice, of which the most severe and obstinate have been admitted into the wards. I have employed for several of these cases the operation of internal urethrotomy, because throughout my experience I have found nothing so efficient, so safe, and so certain. I by no means say any kind of urethrotomy. Anything short of complete division of the hardened tissue is not efficient. Over-distend these strictures, or tease them with dilatation in any fashion, and they are sometimes rendered more than ever unmanageable, while a prolonged constitutional disturbance of a severe kind, as you have seen, follows the interference.

For the operation of internal urethrotomy, we have numerous instruments and systems to choose from: their name is legion. Modification after modification has been made of the earlier forms of urethrotome, both by instrument makers and by surgeons, with the view of accomplishing more perfectly the original design, which is that of ability to divide easily, and more or less freely, the hardened tissue.

Before considering these, I may state that the situation of a stricture is an important element in relation to the applicability of internal urethrotomy of any kind, and also as to its necessity as a mode of treatment. Thus:—

1. A stricture at or near the external meatus is always extremely undilatable, while at the same time it may be divided with the greatest ease, precision, and safety.

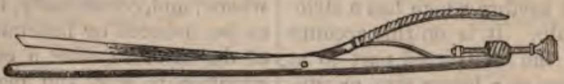


Fig. 21.—A small bistourie cachée.

2. A stricture existing in any part of the anterior three or four inches of the urethra partakes, also, more or less of the intractable quality named, and may be cut with almost as much facility and safety as those in the previous class. As a rule, it may be said, the nearer a stricture is situated to the orifice of the urethra, the more necessary it is to cut, and the safer it is to do so.

3. Strictures in the bulbous part of the urethra, which may be considered as generally ranging between four inches and five inches and a half from the external meatus, are more amenable to dilatation than those of the preceding classes. But when necessary to cut them, it is easy and quite safe to do so as a rule, although it is somewhat less so than to cut those in the preceding class; the difference being due, no doubt, to the larger amount of erectile tissue about the bulb, as compared with the anterior part of the urethra. Bleeding, therefore, may be more considerable, and other risks, such as they are, more liable to be encountered.

In treating this subject, let us first deal with the strictures situated at or near to the external meatus of the urethra.

The best instrument for the purpose of dividing these, although a slender knife will answer very well, is perhaps the small bistourie cachée, which I hold in my hand (Fig. 21.) All that is necessary is to introduce the end of the instrument into the canal, about an inch or more, according to the extent of the narrowing, then to project the blade and draw it outwards, dividing the obstruction. Nothing can be more simple. By means of a screw, the blade is made to project to a small or to a large extent. It should be used so as to make a rather free incision, which is perfectly safe. This drawing, from a preparation, shows the condition in question. All strictures, when laid open on examination after death, present the appearance of much larger calibre than really existed during life. (*See* Fig. 22.)

For all strictures which are more deeply situated I prefer another proceeding, and having disposed of those in the meatus, I shall devote this lecture to the consideration of those which belong to the former category, and which, indeed, form the great bulk of the cases with which we have to do; while they are certainly those which are also of the greatest importance.

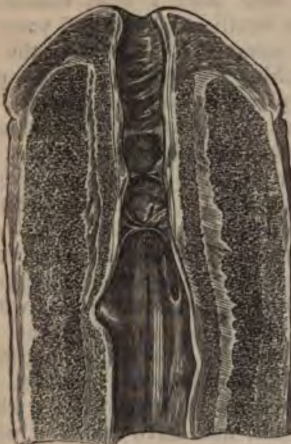


FIG. 22.—Strictures near to the orifice of the urethra.

The instruments employed are, as I have already said, numerous and varied. And there are two distinct methods of making the incision necessary in order to divide the stricture. This fact enables us to group all these instruments in two separate classes.

I. The stricture may be cut from 'before backwards,' on a guide previously passed.

II. Or a blade may be introduced through and beyond the stricture, which is then cut from 'behind forwards,' in which case a guide is unnecessary.

I show you urethrotomes in great variety here, chiefly of French make, the operation having been largely practised in France long before it was employed here. Modifications innumerable of what were originally simple, perhaps we may say rude, instruments, have been made during the present century in that country, and more recently elsewhere. Most of those known by the names of Stafford, Leroy d'Etiolles, Civiale, Amussat, Reybard, Ricord, Trélat, Charrière, Sédillot, Maisonneuve, Voillemier, and others, are before you; there is one also, a recent one, of Dr. Otis, which, like Reybard's, distends the passage at the same time that the incision is made.

I select two as types of the two different systems described of using a cutting instrument—the urethrotome of Maisonneuve and that of Civiale. I select the former instrument because it is not only a type of one which cuts from before backwards, but because it has been more largely and generally employed of late years, especially on the Continent, perhaps than any other; while with slight modifications it has also been used by some surgeons in this country. The instrument of Civiale I have selected because it is the typical one of the other system—viz., that of dividing the stricture from behind forwards.

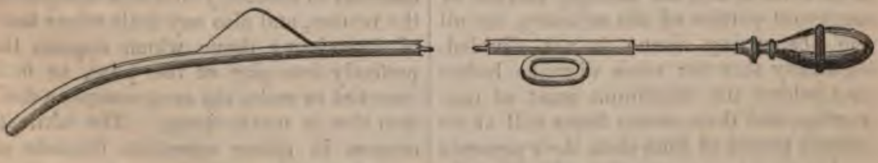


FIG. 23.—The urethrotome of Maisonneuve.

The urethrotome of Maisonneuve consists of a slender guide or conductor in steel, the size and nearly the form of a No. 1 or 2 catheter, but grooved throughout its course. This is first introduced through the stricture into the bladder. Along this groove slides a blade of triangular form, the base of the triangle being attached to a long steel wire stylet, while the two other sides of the triangle project considerably. This blade can be pushed, by means of a handle attached to the wire, through the whole course of the urethra. (*See* Fig. 23.) The apex of the triangle, which is the salient part, is blunt, and the lower side of the triangle only is sharp and will cut. In the act of passing the blade, the healthy part of the urethra is protected from incision by the blunting of the apex (like the button of a foil in fencing), while the sharp side divides certain of the hardened tissues which it meets.

Now, my objection to this instrument is simple and distinct, and I do not hesitate to say is fatal to it in respect of its efficiency for a case of confirmed and indurated stricture, such, indeed, as constitutes that form of the disease which most requires treatment by incision. It is an axiom accepted by most, if not by all, who have carefully observed the results of urethrotomy by any method, that if an incision of stricture is required at all, it is essential that the whole of the obstructing fibres should be divided. No one laid more stress on this doctrine than Syme of Edinburgh, after he had had a considerable experience of his method by external division. The cases of relapse after that operation, he had no doubt were chiefly those in which he had cut insufficiently and left a few fibres undivided. The justice of this observation was verified repeatedly by myself then, and also since in my own practice, with internal urethrotomy. Now, what happens with Maisonneuve's instrument? The blunt apex, which enables the blade to pass without injuring the healthy urethra, fails to cut the most elastic or yielding fibres of the stricture, which, by reason of their yielding character, permit the blade to pass through by stretching them. The blade incises, no doubt, the strongly marked or narrowest portion of the stricture, but all the obstructing tissue is not divided, especially that for some distance before and behind the maximum point of narrowing, and these uncut fibres will at no distant period of time show their presence and reproduce contraction. Further, by no manner of using the instrument can you control or regulate its power. It is a mechanical apparatus or machine, which just accomplishes a certain amount of action and no more. This alone is for me a serious ground of objection to any urethrotome.

Now, suppose for an instant that it were possible for you to have the stricture before you open to your eyes and hands; you certainly would take a little scalpel and employ it for each case according to its needs, intelligently dividing the obstructing fibres as much as is necessary, and no more. But with a very little practice it is perfectly easy to do this without seeing the stricture—that is, to apply a little scalpel, dividing where you wish and not elsewhere, just as you divide the constricting fibres at the ring of a hernial sac. And I need scarcely say that this intelligent action of yours will produce something better than the work of a machine which any ignorant person can employ just as well as you. The difference in the two cases resembles that which exists between the music of an organ produced by a handle, and the music which results from the facile hand of a skilful performer.

There is a question of no mean importance which arises from the comparison of incision made by machinery with incision made by the intelligent hand. That is the real question in urethrotomy as presented in these two systems. And the instrument I now show you, which I always use, and have operated with so many times in the wards here, is the type of the method which affords the opportunity of making the incision according to the operator's will and judgment. It is nothing more than a little knife with a long handle, and is used precisely as we use a scalpel anywhere else. Just as we should use a small knife in tenotomy, without the sense of vision, where it is not necessary, but guided by the sense of touch, so do I advise you to cut in urethrotomy. I carry the parallel one step further, and remind you, that just as it is essential in tenotomy to divide completely the tendon, and also any little minor band of constricting tissue which opposes the perfectly free play of the joint, so is it essential to make the same complete division also in urethrotomy. The ultimate success in either operation depends on attention to these particulars.

The instrument which I hold in my hand, and to which I have been referring, is a modification of the urethrotome of Civiale, made shorter for me, with a different handle and a much smaller bulb than it is customary to make in Paris. The shaft of this is about the size of No. 3, English scale, with an oblong bulb at the end not larger than No. 5 or No. 6. Within this is a little blade which, by a clever contrivance, the operator can make to issue at will, as much or as little as he desires, and which he can also sheath instantly at his pleasure. The bulbous end gives him the power of exploring the urethra at the time of the operation, and of determining precisely where and what he ought to divide (Fig. 24).

The bulb is to be introduced, say fully half or three-quarters of an inch beyond the maximum point of narrowing felt, the blade is then to be projected there, and drawn steadily through the whole of the constricted portion outwards towards the meatus, in which direction the incision is sure to be certain and complete.

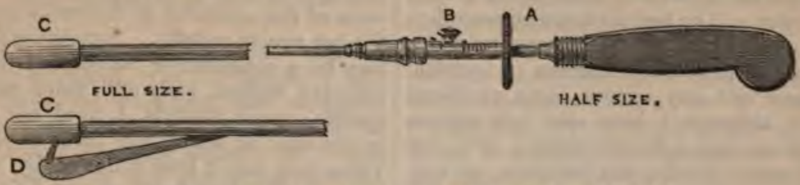


Fig. 24.—Author's urethrotome modified from that of Civiale.

Now I at once anticipate an objection which I expect you all to raise. I expect you instantly to exclaim, 'Why, if an instrument so large as No. 6 can be passed through the stricture, should there be any occasion to cut at all? Surely it is for small strictures, through which only the finest instruments can be passed, that an operation is necessary, and for such strictures this instrument is obviously unfitted by its size!' Such criticism is quite natural at the first glance, and from those who have not learned by considerable experience certain important facts about confirmed stricture.

I reply, first, that the *narrowness* of a stricture alone, however extreme, does by no means render a cutting operation *always* necessary. Some of the narrowest strictures I have ever seen have been very successfully and rapidly treated by simple dilatation; although this is admitted to be a rare occurrence.

Secondly, the quality which makes incision of a stricture necessary is, as I have previously shown, 'resiliency'—that property which leads it to contract again rapidly after any dilatation. This quality affects strictures which will admit No. 5, No. 6, or No. 7 quite as frequently as narrower contractions.

Thirdly, supposing it is necessary to cut a stricture which is narrow and only admits No. $\frac{1}{2}$ or No. 1, there is *never any difficulty in dilating it temporarily* up to No. 6 for the purpose of admitting the urethrotome which I recommend.

All you have to do is to keep the patient in his room from three to five days with a small soft gum catheter tied in, which produces scarcely any inconvenience; and thus by 'continuous dilatation' you can always bring the narrowest and most resilient stricture to the required size to admit the urethrotome. Having done so, you are able to perform the operation in the best possible circumstances. And the few quiet days spent in preparation are advantageous rather than otherwise; the result furthermore being that you can now make an incision in the manner I have described, directed by your intelligence and adapted to the particular case.

For safety to the patient and excellence in result, both in regard of his present and future condition, I greatly prefer the operation I have described to any other method I have ever seen.

I will now briefly detail the stages of the proceeding:

First: The situation of the stricture or strictures is, of course, previously ascertained by the necessary examination—that is, their distance from the external meatus.

Secondly: It has been ensured, either by tying-in a catheter or otherwise, that at the time fixed for the operation the stricture is sufficiently patent to admit the bulb of the urethrotome to pass through it. The stricture should just admit about No. 6 (English scale). Having given the patient some ether, I withdraw the inlying catheter, which in almost every case has been necessarily present for a few days, and at once pass carefully the bulb of the urethrotome through the stricture, which usually requires a little gentle pressure and management; after which the little bulb is felt free and movable in the urethra on the further side. In this situation, and at least half an inch beyond, or on the bladder-side of the stricture, you make the blade project to requisite extent by means of the simple mechanism in the handle which I show you, and directing the edge to the floor of the urethra, you press it firmly there, and draw it boldly outwards, as if you would make an incision, say an inch and a half or two inches in length, so as to divide all the thickened tissues which constitute the stricture. You feel them sometimes offering much resistance. Take my word for it, you need not fear freedom of incision. I never saw any serious harm produced by it, although I have seen less success resulting than I desired where I have not sufficiently divided the stricture, as may have been the case in some of my earlier experiences, and have so left a fibre or two uncut. But I have never had occasion to regret a free and complete division.

Next, you introduce a No. 13 plated sound, not conical, which should go quite easily into the bladder, and not be in the least degree 'held' in withdrawing it: keep along the upper portion of the canal, and the point of the instrument will not get into the incision. If it is 'grasped' or 'held' a portion of the stricture remains undivided, and should be at once cut; the same urethrotome, or another with a larger bulb, being introduced for the purpose. After which No. 13, 14, or 15 should pass with perfect facility. Or, if any other point of narrowing be discovered, after the principal one has been cut, it also should be divided. The operator should be provided with a series of metallic exploring instruments, with terminal olive-shaped points, ranging from a small size up to No. 14, so as to be quite certain of the whole canal from the meatus downwards (see page 19). All being completed, you should take a No. 11 or 12 well-curved gum catheter, and pass it into the bladder, tying it there in order to retain it forty-eight hours. It is best to introduce it well-curved or upon a stylet in order to avoid the wound, which otherwise the point of the instrument might enter, occasioning you some embarrassment. Of course the stylet, if used, is withdrawn immediately afterwards.

Now, as to results: in the operations I have done, about three hundred in number, I have rarely seen any bleeding worth naming—sometimes only a few drops appear; once, and once only, it was severe, although it ceased ultimately, and all went on well; this was in a case I have recently met with. On two occasions some extravasation of urine occurred when the catheter became displaced—an ample reason for always employing one—and once only an abscess has followed; but you yourselves can also form a judgment, to some extent, of these questions, since you must have seen at least twenty cases of this operation in the wards during the last twelve months. Sometimes there may be a considerable amount of fever, but very seldom, and, still more rarely, cystitis; much depends, I need not say, on the way in which the thing is done. Twice only has it been followed by fatal results. The first death occurred in the case of a man in one of my wards here, for whom I performed the operation as a last resource, and the autopsy showed such an advanced stage of disorganisation in the ureters and kidneys, that I am not surprised at the result. The second case, in private, was a very remarkable one, in which death took place from embolism of the heart and great vessels within ten days after the operation, no very obvious sign of local disturbance elsewhere having manifested itself. If anything has surprised me, it is the extreme safety of the operation, for my earliest belief about it was that it was by no means free from risk, and I hesitated to employ it except in very urgent cases. Now, with my present experience, I never hesitate on the score of danger, for there is almost absolutely none; of course I speak only of that kind of urethrotomy which I employ, and have described in this and alluded to in the preceding lecture.

It is not uncommon, although quite exceptional, to have an attack of fever after the withdrawal of the inlying catheter forty-eight hours after the operation. The first time the patient passes his urine, a drop perhaps enters what remains of the incision, and he has a rigor in an hour or two's time, and that is all. To avoid this as much as possible I always adopt the following plan:—When removing the catheter, forty-eight hours after the operation, I withdraw all the urine, order the patient a hot hip-bath for fifteen minutes, and send him back to bed to be well covered up, with instructions not to pass water until he feels a manifest desire. This will probably not occur until six hours after the instrument was withdrawn. He then stands up, makes a full stream, is generally very much astonished at its volume and the ease with which it flows, and goes back to bed as before for the day. Following these precautions, you may hope he will escape the rigor; but if not, you know, at all events, that there is no risk, and no ground for anxiety. Sometimes, but this is quite exceptional, the fever is somewhat more severe and prolonged.

The subsequent treatment may be briefly sketched. On the fourth or fifth day after the operation, pass a conical French bougie with a large bulb, so as not to open the little wound. If it does not pass easily and encounters any obstruction, withdraw, and pass a well-curved metal instrument, which is not conical; the former, however, usually suffices. Repeat the proceeding in three or four days, and No. 13 or 14 mostly pass with considerable ease. After this, pass the instruments once a week, and the patient will do so himself at increasing intervals, ultimately arriving at, say, once a month.

This operation gives, I believe, more lasting results than any other. You have seen me perform it for cases which have experienced every other known treatment, and in which the stricture had returned as badly as ever. For most of these I think it is the best treatment known. I do not claim for it the power to remove organic contraction. Such a result is impossible. The treatment has yet to be devised which will remove absolutely, and for ever, the occurrence of recontraction in a patient once the victim of an organic stricture. Thus, in some instances I have repeated this operation for the same patient, when eight or ten years have elapsed, and with the best result: and I have had some cases in which I have done it a third time, after a second long interval. I should not hesitate to repeat it as often as might be necessary to remove the serious troubles which an obstinately narrow passage produces.

Briefly let me, at the close of this subject, remind you that, in view of any operation, and indeed in all cases of impeded micturition, attention to the general health often aids in a considerable degree to mitigate the local troubles. Do not overlook the state of the digestion. If this is unsatisfactory, if the bowels are unduly constipated, the troubles of the bladder and urethra will be much increased; and frequently it happens that a mild mercurial, followed by a dose of Glauber's salts, or of Friedrichshall water, in the morning, gently unloads the liver and bowels, and greatly relieves the most distressing symptoms. Then take care of what your patient eats, and more especially let his alcoholic drinks, if any, be taken in moderate quantity, and be of the mildest kind.

There is only one other word to say. I do not seek to make you partisans of any single method. You hear one surgeon say, 'I always follow such and such a method: there is nothing to equal it.' Or another, that he always adopts the proceeding of M. Ricord; and a third that of M. Maisonneuve, and so on. There has been great activity among inventors of instruments of all kinds, especially in Paris, and you may see from several of them very excellent results. Do not limit your selection to any method which I or any other may recommend. If you have much to do with stricture, or with such complaints, be assured you will want all the resources within your reach. Consider them carefully, and select for each individual case that method which appears in your judgment to be best adapted for it. Above all things, be patient, unsparing of time, use a light and cautious hand; and then, whatever instrument or method you employ—provided you have confidence and some experience in the using it—it will probably be the best not only for you but for your patient.

LECTURE VII.

HYPERTROPHY OF THE PROSTATE AND ITS CONSEQUENCES.

GENTLEMEN,—We may pass from the subject of stricture to another very important complaint, and one of common occurrence—viz., hypertrophy of the prostate. It is one which affects a large number of elderly people, and thus the practitio is almost certain to come in contact with it pretty frequently. Hence the necessity for our studying these cases closely, and the more so because we do not see them very often in the hospital beds, many of them being treated as out-patients.

I shall commence with two or three important generalisations for you in relation to impeded or frequent micturition.

Impeded or frequent micturition in an otherwise healthy young man, say from eighteen to twenty-five years of age, is more likely to be due to some inflammatory action affecting either the urethra or bladder, than to any other cause.

Impeded or frequent micturition in a middle-aged man, say from twenty-five to fifty-five, may be due to the same cause, but is also likely to be due to stricture of the urethra.

Impeded or frequent micturition in an elderly man, say at and after fifty-six years, is very often due to hypertrophy of the prostate, and consequent inability to empty the bladder by his own efforts.

You will very rarely find much impediment to micturition produced by stricture before twenty-five years; you will never find it due to hypertrophied prostate before fifty-five years.

Now, I wish to guard you against confounding this last-named condition, hypertrophy of the prostate, with enlargement of the organ from any other cause. The enlargement which we call hypertrophy is quite '*sui generis*.' No other organ of the body is similarly affected. It has no relation to, or affinity with, inflammatory deposits, such as we may observe in the swollen tonsil, or in lymphatic glands. The increase in bulk is due to a new formation of gland-tissue, either throughout the organ or in isolated portions. I know nothing analogous with it, except the so-called fibroid tumours of the uterus, which consist mainly of an augmented production of the constituent elements of that organ. So that the new product in the prostate is not a new formation like cancer or epithelioma, and is, in fact, not a 'morbid' growth at all, although it induces diseased conditions of the bladder as a result of the mechanical obstruction occasioned by its presence. I make these remarks because I so often observe confusion of ideas respecting hypertrophied prostate. Few people appear to know that there is nothing whatever of relation between it and the enlargement resulting from inflammatory deposit, the latter being essentially a phenomenon occurring in the first half of human life, while, as I have already said, the former belongs solely to the latter third.

It was formerly stated by Sir Benjamin Brodie, that 'when the hair becomes grey and scanty . . . . the prostate gland usually, I might perhaps say invariably, becomes increased in size;' and that is the impression which a large portion of the profession has generally entertained. Such was certainly the common belief when I first began to make some special researches in reference to this matter, now some twenty-five years ago. I was then at the pains to examine after death all the bodies of male patients over fifty-five years of age who died in the Marylebone Infirmary; and afterwards, in Greenwich Hospital, the inquiry was pursued by Dr. Messer and myself. I took care to dissect each prostate very carefully, and I discovered that so far from the presence of prostatic enlargement being the rule, this condition was quite exceptional. I examined about two hundred cases—not picked cases, but all who died consecutively within a certain period, and I found that about one in three exhibited after death some enlargement of the prostate. But do not suppose that anything like a large proportion of those manifested any signs of this condition during life; for only about one in seven had any symptoms of obstruction to the flow of urine, and these were slight. So that you see it is not to more than one in (let me say) fifteen or twenty men who live beyond fifty-five years of age who can be expected to require relief for this affection. The number thus estimated is, no doubt, considerable. If you suppose that one man in every twenty who are approaching sixty years of age has symptoms of enlarged prostate, you will see at once how often, if you have anything like a large practice, you may be called to advise these cases.

We will now consider one or two anatomical points connected with enlarged prostate. This organ is, as you know, composed of two lobes and a median portion. Now, the part affected with hypertrophy very much influences the results in relation to the function of micturition. It is not necessary that there should be much enlargement of the prostate in order to produce very severe sym-

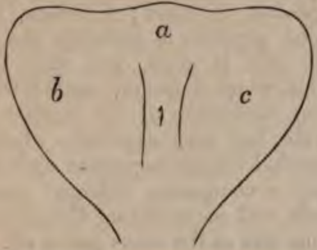


FIG. 25.—Diagram of healthy prostate. *a*, median portion; *b* and *c*, right and left lobes.

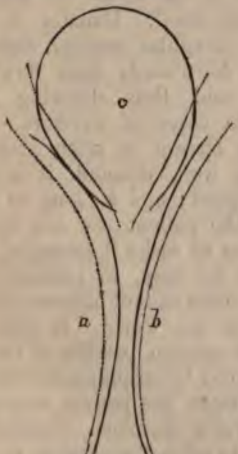


FIG. 26.—Diagram representing a tumour filling neck of the bladder. The line which the catheter may take on either side of it.

ptoms. On the other hand, you may have a very large prostate, and may have almost no symptoms. Almost the largest I ever saw, as big as a small cocoa-nut, produced very little obstruction to the flow of the urine. On the other hand, the largest prostate I have yet seen had produced absolute retention for about five years before the age of sixty-three, when the patient died. Thus, if the median portion of the prostate is only slightly enlarged, there may be complete retention. Let this diagram, fig. 25, represent the two lobes, and the median portion. If there is a small nipple-like projection at the median portion just filling the internal orifice of the urethra, that may be quite sufficient to prevent every drop of urine passing by the natural efforts. Sometimes a considerable eminence arises here, shown in the diagram fig. 26. Sometimes there is a considerable enlargement on one side, so that the passage is circuitous; and you will sometimes find the catheter carried to the right or left, according as the prostate may be large on one side or the other. I show you several examples: two are depicted at figs. 27 and 28. You will therefore remember that if on examining a patient you find a very large prostate, it does not necessarily follow that he should

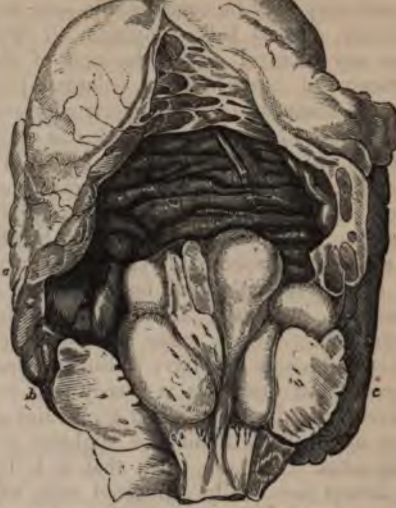


FIG. 27.—Section of bladder and prostate; the former hypertrophied, the latter forming prominent tumours within the bladder.

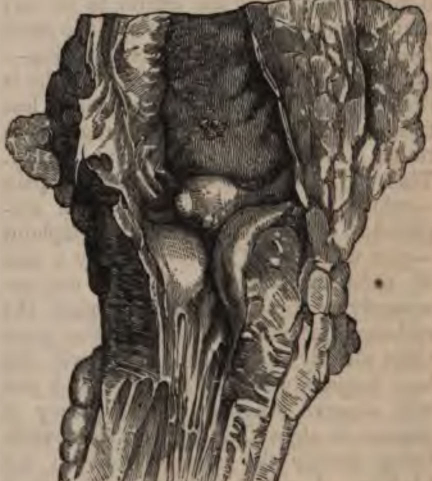


FIG. 28.—Section of bladder and prostate, showing marked but not great enlargement of lateral lobes and median portion.

have great difficulty in passing his water; and, on the other hand, although you may be unable to discover enlargement by rectal examination or otherwise, you may not therefore conclude that all his troubles —and they may be considerable—are not entirely due to this complaint. I will now say a word as to the age of the patients. I never saw an enlarged prostate (I mean, of course, hypertrophy, not enlargement from inflammation and other causes) until after the age of fifty-four; and if I have not seen such a case, you may say that it never or most rarely occurs. The usual time at which it begins to show itself is from fifty-seven to sixty. If a man has it at all he will have it generally by sixty. If he is free from hypertrophy when over sixty-five or seventy, he may still have it, but in a less degree; but even this is a very rare occurrence. I have examined the bodies of men at ninety, without the slightest enlargement. You see, then, that it is by no means necessarily connected with advanced age. The man who escapes it at sixty-five will be not unlikely to escape it altogether, or nearly so.

I speak next of the symptoms. An elderly man comes to you and says that recently his water has not passed so easily; that it has issued in a small and feeble stream, and that he cannot propel it more quickly by his efforts to do so; that he requires to micturate a little more frequently, especially in the morning—probably two or three times while he is dressing, after which it becomes less troublesome; but during the night it is rather more frequent than during the day. Then if he does not say much about pain —which might naturally excite a suspicion of calculus, or some other complaint —you will say, 'This is probably a case of enlarged prostate.' You do not necessarily proceed at once to pass the catheter, but you will ask the four questions already referred to. You will ask how frequently he makes water, and you will observe whether the frequency is greater at night than by day, the reverse being usually the rule in stone in the bladder. I cannot tell you why, but it very often happens that patients with hypertrophied prostate pass as large a quantity of urine during the eight hours of night as during the sixteen hours of day, hence the disturbed rest and sleep of *which they complain.* You will also further inquire whether the water ever passes without the patient's knowledge, or without his willing it. In many advanced cases, you will find that some urine passes during a violent effort, such as coughing, or when he is unconscious at night, during sleep. If so, the case is probably one of rather long standing.

Next, you will inquire for pain, and, if any, whether before, during, or after the passing of water; if before, hypertrophied prostate is probably the cause. If the pain is after, you may suspect calculus, which comes into contact with the mucous membrane of the bladder when the water has been expelled; whereas, if a distended bladder is present such as frequently accompanies enlarged prostate, the pain will occur during distention, and becomes less as the urine passes off.

Then you inquire about the character of the urine, whether it is clear or cloudy. In most instances at an early stage it is clear. In a great number of cases of prostatic enlargement, although the bladder has not been emptied for months or a year or two, the water is still clear. On the other hand, if the case is one of long standing, the water will certainly be cloudy. And making this inquiry will lead you to ask about the characters of the stream itself. Usually it flows in a feeble irregular manner, rather falling directly downwards than flowing in a current, and thus differing from the stream in cases of stricture. In stricture the stream is often propelled exceedingly well, although it is no larger than a thread; and so long as there is a stream, the patient can act upon it by will, so as to make it stronger; whereas, strain as he may, in prostatic enlargement, he often cannot influence the stream, except for the worse. It may happen, from the median portion of the prostate being forced by straining into the passage, that the more the patient strains the less well he voids his urine. Generally speaking, the expelling apparatus at the neck of the bladder is involved in the enlarged prostate, and ceases to act; so that with all his straining he cannot make much difference, and the stream is not propelled with any force. You may ask the patient to let you see him pass water, if he can, for that will help your judgment materially.

Then you ask the fourth question: 'Do you pass blood?' Usually, in the stages, the reply will be in the nega- although a little may appear after h exercise, so far suggesting the pre- e of stone; but hæmorrhage is by neans usual.

Then you complete your diagnosis by hanical means, and for this purpose a ieter is first to be used. You should ariably make the patient pass water be- the instrument is passed, because your ect is not merely to ascertain whether arged prostate exists, but, what is much re important, namely, how far it is a rrier to the exit of urine from the idder. The important fact for him and you is not the exact size, condition, or ipe of the prostate, but to what extent hinders the exit of urine. And it is the quantity of urine invariably left behind which will chiefly determine the future treatment. But the patient often objects to the use of the instrument, erroneously thinking that the frequency of his calls to pass water indicate that he is already passing too much urine, and not the use of the catheter to withdraw still more!

Now, with regard to the employment of the instrument for patients with the symptoms described, whatever they may think, you are not to forget that undue frequency of passing water, and still more the passing of it involuntarily, indicate the necessity for the catheter.

First, in relation to frequency: it is not uncommon for the practitioner to be misled by a fact often associated with it—viz., that the daily quantity of urine passed is quite equal, if not more than equal, to the healthy average. I have often heard this assigned as a sufficient reason for not using a catheter in these cases. It is urged, with a certain show of plausibility, that 'a sufficient quantity being passed every day, how can there be habitually retained urine in the bladder?' A moment's thought will prove that the question of habitual inability to empty the bladder is not in the slightest degree affected by an observation of the quantity of urine passed, this indicating solely the activity or the reverse of the excretory function—that is, the action of the kidneys. The reservoir—in other words, the bladder—may be always half-filled, or even more, with urine, whenever the act of micturition ceases; but it none the less serves to receive and to transmit the daily two or three pints. The reservoir is diminished in capacity, just so much as equals the space occupied by the constantly retained urine, and frequent micturition is the necessary consequence; that is all. In short, the amplitude of the quantity passed daily is not to be regarded as affording the slightest evidence in relation to the inquiry, 'Is the bladder emptied or not by its own natural efforts?'

Secondly, in relation to involuntary micturition, so often miscalled 'incontinence;' it is really remarkable how common are the errors, not merely of patients, but of practitioners on this point. They are apt to be misled by the fact that the patient insists, 'I do not make too little water; I am making water too frequently, and too much of it, and even against my will, and therefore my bladder must be empty. Tell me how to retain my water, and I shall be much obliged to you. Don't think of drawing it off.' It is surprising how that sometimes influences the practitioner. Nevertheless, these are the very circumstances in which you should pass the catheter and ascertain the real condition of the organ.

Always bear this in mind (and I wish, figuratively speaking, to render that sentence in the largest capitals), that INVOLUNTARY MICTURITION INDICATES RETENTION, AND NOT INCONTINENCE.

There are a few exceptions to the rule, but very few. Most of the mistakes that are made on this point arise from the use, or, as I shall show you, the abuse, of the word 'incontinence,' which means, of course, that the bladder is empty; and certainly, when the bladder cannot hold its contents, its condition is rightly described by the word incontinence. Now, that happens only in very uncommon, but well-defined circumstances, such as in some cases of cerebral or cerebro-spinal paralysis, and in rare injuries to the neck of the bladder; and in these the urine runs off as fast as it comes from the ureters, the bladder having ceased to act as a reservoir. You see this one external physical sign is the same in these cases and in those in which the bladder is overdistended with urine—that is, there is urine dribbling off by the urethra. But mark how totally different are the two conditions in question: in one the bladder is full, in the other the bladder is empty. Whenever, then, you meet with this involuntary flow of urine miscalled 'incontinence,' do not confound it with the con dition in which the bladder is empty. Rely upon it the bladder is full, and the only way of relieving the patient is by the use of the catheter. I lay great stress upon this, because I have seen lives sacrificed to a forgetfulness of this point. I have made post-mortem examinations of persons who have died solely from the effects of undiscovered retention, the existence of this fatal condition not having been suspected during life, because the urine constantly passed off, as it was supposed, 'so freely.'

Now, we know that our views of things and our consequent acts, are very much determined by the manner in which we use and apply words respecting them, and it is impossible to be too clear and defined in all our language, especially in that which relates to pathological conditions and surgical practice. I cannot express to you how strong my sense is of the importance of this matter; hence I have made it my constant business to point out the common misuse of terms in connection with this subject.

First, then, the term incontinence, which means the bladder is empty, or 'cannot contain,' should never be employed by you to denote the phenomenon that the patient's urine flows involuntarily; for, as we have seen, in that condition the bladder is generally full. It is better to speak of it as 'involuntary micturition,' without reference to the cause, and when this is found to be distended bladder, to use the term 'overflow.' Then, remembering always my maxim, that 'involuntary micturition indicates mostly retention, not incontinence,' you will never make the fatal blunder I have spoken of, and which I assert to be so common. This, too, assimilates our usage very nearly to that of French surgeons. The French, with their more logical use of language, speak of the bladder as 'engorged' and 'overflowing,' but never as 'incontinent,' except to denote that rare condition in which the bladder is always perfectly empty. I have, therefore long been in the habit of denoting a bladder which is full, but allows surplus urine to run off little by little against the will of the patient, as an 'engorged' bladder, and the phenomenon thus described as 'overflow;' and I hope you will do so too.

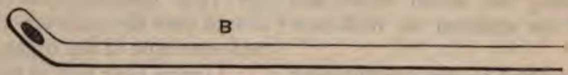


FIG. 29.—The French coudée catheter.

This brings us, by the way, to another common instance of the misapplication of terms. In this country, the condition of the organ just alluded to is often called 'paralysis' of the bladder, and the unfortunate word leads to mistakes in practice. The bladder is rarely paralysed. I know nothing of it except as an effect of spinal or cerebral changes. The bladder is never by itself the subject of paralysis, meaning, of course, an affection of the nerves, either central or peripheral. It may be unable to expel its contents, because there is mechanical obstruction, as enlarged prostate, stricture, or impacted stone, or because the muscles have lost their power of contracting from long overdistension, a condition more properly to be spoken of as 'atony.' But in none of these cases is the inability due to *impaired nervous supply*, and consequently the use of the term 'paralysis' is unwarranted and misleading. The condition to which that term is rightly applied will be considered at some subsequent meeting. [*Vide* Lecture XXII.]

After this digression, which its importance must excuse, we shall now consider the physical diagnosis of hypertrophied prostate.

Immediately before commencing, the patient is to pass urine to the extent of his ability, and as soon as he has finished, introduce a flexible catheter; if an English gum let it be well curved, and about 8 or 9 in size. Better still is the French coudée catheter, say about 14 to 16 of that scale (*see* Fig. 29).

In using the last-named instrument let it be passed in a downward direction (the patient being upright) for the first half of its course, gradually descending to the horizontal line as it is about to enter the bladder. If you use an English gum catheter, remove the stylet, and keep the shaft, in passing it, well back in the groin, so as to maintain the curve. In either case, as soon as you have arrived at the bladder, carefully empty it, and note the quantity withdrawn. It may vary greatly, from an ounce up to almost anything you please. I have drawn off six pints, but that is a very large amount. You may find commonly from six to twenty ounces. To this urine, which you have removed by instrument, and which the patient could not pass by his own efforts, I apply the term 'residual urine,' and shall thus speak of it hereafter.

Next, the patient lying on his back, you may place your finger in the rectum, and examine the size of the prostate, for any deviation from its natural form and size, and if the latter is augmented, whether the enlargement is more on the right or the left side. Of course you do this as gently as you can. The finger should be covered with grease and very slowly introduced; or you may produce considerable and unnecessary pain. Make pressure on the prostate at different points, noting if it is uniform in consistency, or more tender in one spot than in another. The position described is preferable to any other, because you can make gentle pressure with the unemployed hand above the pubes, and so bring the bladder and prostate near the finger in the rectum, a material assistance sometimes in your endeavour to ascertain their condition. Such are the inquiries which it is desirable to pursue, and beyond these it is not usual or desirable to carry your investigation.

We now come to the Treatment. The Medicinal Treatment of hypertrophied prostate may be dismissed in a few words. Medicine is powerless to diminish the hypertrophy. There may often be temporary enlargement from congestion; and that you can diminish by treatment. But true hypertrophy cannot be diminished by any known means. Numerous agents have been employed, both internally and as local applications; for both of which, as might be supposed, preparations of iodine and of mercury have been particularly vaunted. And, notwithstanding all that has been claimed for such agents in certain quarters, I assure you with regret, but with the most complete confidence, that neither iodine nor mercury does anything but mischief, however employed. Besides these, other remedies, as hemlock, hydrochlorate of ammonia, liquor potassæ, &c., have been tried. Nevertheless, I have simply to say that, for the present, we know no means of checking the progress of hypertrophic enlargement.

Then, again, the effect of pressure has formerly been regarded as of some value. It has been applied in various ways; perhaps in no form better than by water-pressure through the agency of a syringe, exerting expansive force, within an india-rubber tube previously placed in the prostatic urethra—a method tried by myself some five and twenty years ago, but ultimately laid aside as producing irritation without any sensible improvement. I just allude to this fact, as I regret to observe that a recent attempt to revive the practice has been made; especially as there is not the slightest foundation for hoping to attain any advantage, at all events for the patient, by that process.

On the other hand, it is in our power to render the subject of hypertrophied prostate most valuable service: so much may be done to palliate the distressing results of his malady. They arise from mechanical obstruction to the outflow of urine, and the remedy therefore consists chiefly in the use of mechanical appliances. The first object of treatment is to relieve the partial retention of urine by the catheter. There are two causes which produce this retention of a certain portion of urine, and which no efforts on the part of the patient enable him to pass; and these I shall ask you to consider. The first is, as you know, the obstruction of the enlarged prostate itself at the neck of the bladder. But there is, moreover, an inability of the muscular coats of the bladder to contract and expel its contents, and it happens thus:—In order to overcome an obstacle to the outflow of urine the muscular fibres are greatly increased, and hypertrophy of the vesical coat results to a large extent, just as the walls of the heart thicken when obstruction exists in one of its main outlets. The thickened bladder is much less distensible than the bladder of normal character, and the organ is often equally disqualified for retaining much urine or for expelling it entirely; the cavity of the bladder being diminished, and its function as a reservoir impaired, in part by the protrusion of enlarged prostate into the interior, and in part by the rigidity of the coats, as above explained. It is in such cases that the habitual use of the catheter is necessary. Often, as long as the patient lives, he will withdraw more or less of the urine, sometimes all of it, by the catheter. And such a patient may continue to do this for many years, and at the same time remai actively engaged in the business of life. And it is by no means certain, if he is well taken care of, that his days are much, if at all, shortened as a consequence. One thing is essential, as in all instances where a daily catheterism is necessary—namely, that the instrument employed, and the mode of using it, should be those which effect the object with the minimum of trouble and irritation. The more frequently it is necessary to introduce the catheter, the more essential it is that the easiest manner of doing it should be ascertained and followed.

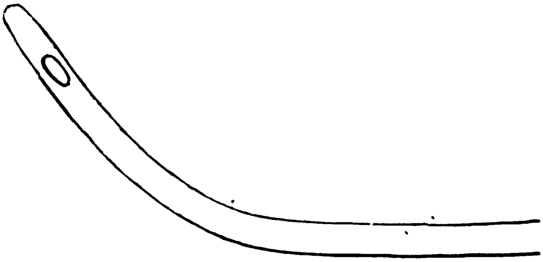


Fig. 30.—Example of badly-curved catheter for enlarged prostate.

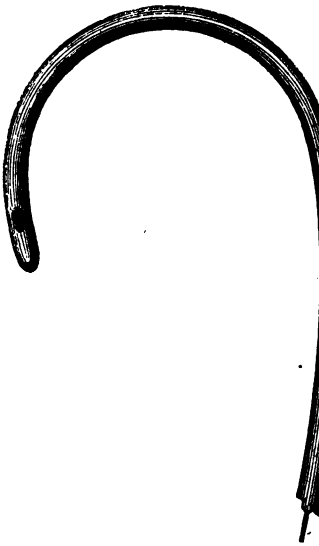


Fig. 31.—A catheter mounted for use on an over-curved stylet.

In almost all cases—although an occasional exception appears in which a silver instrument is preferable—a soft flexible catheter achieves its object in the best manner. And the most generally successful, and the most easy, is the French coudée catheter. Its turned-up point passes over whatever eminence is present at the neck of the bladder more readily than any other instrument, as a rule. In some cases the English gum catheter compares with it advantageously, when well curved and properly managed; but some preparation of the instrument is necessary to elicit its best qualities. The instrument-maker generally curves the catheter pretty much in this way (*see* Fig. 30): the point straight and not well curved—the worst form in which a catheter can be placed for use. For the purpose of passing easily over a prostatic enlargement, a catheter ought to be well curved *to its very point*. The following is an excellent plan for treating the English *gum-elastic* instrument so as to prepare it *for successful action* when it is wanted:—Let it be mounted on a strong iron stylet, greatly over-curved (*see* Fig. 31), for a month or so before it is wanted:—I may say here, that if you require simply an inflexible instrument, a silver catheter should, as a rule, be selected—not an elastic catheter with a stylet in it. To return: your object is to carry the instrument easily and safely over an obstruction formed by the enlarged prostate: and as the heat of the urethra always relaxes the curve of a flexible instrument, in its progress towards the neck of the bladder, the ordinary gum catheter becomes nearly straight, and will not pass over the enlargement. But, when you have a catheter which has been well over-curved in the manner described, wait until the moment before using it to remove the stylet and turn back the shaft, so as to convert the extreme curve into an ordinary one. And what happens when you pass it? In spite of the heat of the urethra, the catheter has a tendency to curve more, instead of less, as it passes down the passage. And this tendency often makes precisely the difference between success and non-success. That little manœuvre I regard as of extreme value. It is very simple: but, I repeat, keep the catheter over-curved—not for stricture, but for enlarged prostate: then turn back the shaft immediately before using. The curve gradually increases as it goes onwards, and it passes over the enlargement into the bladder. This is so simple that it may seem to you scarcely worth so much attention; but I can assure you that I know few practical hints that exceed it in value.

But the English gum-elastic catheter may be rendered very effective by another mode of using it. It possesses a quality just referred to, which is found in no other. If put for a minute or two into hot water it becomes quite soft, and may then be bent into any required form, adapted, it may be, for the necessities of some particular case; and this form becomes nearly permanent if the instrument is plunged into cold water, care being taken while doing so to preserve the desired form. But the best form so produced may easily be spoiled by your mode of using it. Of course, the curve must not be altered while the instrument is passing through the anterior part of the canal, for it is at the posterior part that this form is required; the shaft of the catheter must be kept closely back in the groin, and the penis brought round the curve, so as to preserve the latter until it reaches the deep urethra, when, by well depressing the shaft, the point will rise over any obstruction into the bladder.

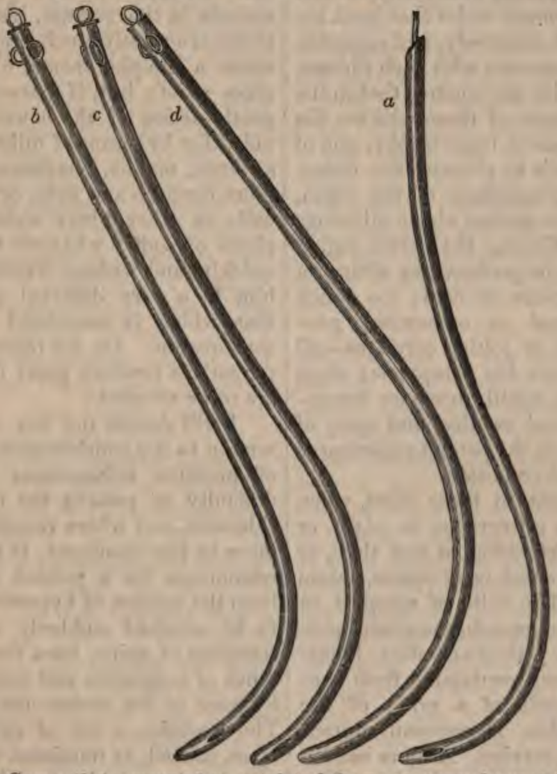


FIG. 32.—*a*, Gum catheter mounted on a stylet of the proper curve for use; *b*, *c*, *d*, silver prostatic catheters of different curves. The Nos. 1, 2, and 3 of the instruments which I employ.

I have just described and recommended to you the French coudée catheter. A not very important variety of this instrument may just be named: the addition of a second bend or elbow to it, from which circumstance it is distinguished as the 'bicoudée' catheter.

Now and then a case occurs in which a silver catheter passes with greater ease and safety than any other, and such instruments should be accessible in two or three forms and sizes. A prostatic silver catheter should be one or two inches longer than the ordinary catheter: very rarely it is necessary to employ one that is four inches longer. The curved portion too, is often prolonged—that is, it embraces a larger arc—say, more than a fourth—of the circle. (*See* Fig. 32.) The size should rarely be less than No. 10.

The general or constitutional treatment of your patient is by no means to be disregarded; but I shall defer a good deal of what I might otherwise say until we discuss the subject of chronic cystitis, which will occupy a subsequent lecture. Cystitis is associated with so many diseases of the urinary organs, that I may as well refer to the treatment under that head, instead of taking it separately, and recapitulating it in connection with each disease. Here, however, let me remark, that in the general management of those who are the subjects of prostatic hypertrophy, one of the main objects is to prevent the occurrence of local congestions of the organ. You must tell the patient above all things to avoid chills affecting the pelvic region—such as might be produced by sitting on cold seats, exposure to cold; too much excitement, sexual or otherwise; prolonged journeys, or jolting carriages—all liable to aggravate his symptoms; since the prostate very readily becomes temporarily inflamed and swollen, and many of the troubles which the patient experiences depend upon that condition.

A useful agent in these cases, when there is frequent micturition at night, or when pain is distressing at any time, or interferes with the rest, is, of course, opium in some form. The salts of morphia, in small doses by the mouth, sometimes conduce greatly to a patient's comfort. Sometimes, a suppository, containing from one-third to two-thirds of a grain of the acetate of morphia, in cocoanut butter, renders essential service. A more certain method is subcutaneous injection, often, however, less convenient to resort to. Some have advised combination of belladonna with morphia in the suppositories; it is always a mistake in relation to the prostatic patient with difficulty in emptying the bladder. Belladonna has a special power to paralyse the vesical expulsive muscles, and when irritation, or want to make water, arises from the pressure of urine which the bladder fails in expelling, the difficulty is only aggravated by belladonna. I have seen some painful illustrations of this error. In the use of opiates of all kinds, you must never forget to inquire for their effects on the appetite and digestion and on the state of the bowels—in some cases considerable. There is great difference in the ability to tolerate opium, in different individuals; although there are very few who are not constipated by it, and who require therefore some laxative medicine.

I must not omit to say how important it is in all cases to attend to the action of the bowels. The patient's comfort is sometimes ensured by regulating their function, for if he is the subject of habitual constipation, and prone to retain scybalæ in the rectum, his urinary symptoms are mostly much aggravated. Sometimes a simple enema of warm water gives relief; but, if necessary, the daily gentle action of the bowels must be provided for by means of mild laxatives, such as senna, manna, bitartrate of potash, sulphur, rhubarb and soda, or by Friedrichshalle or other bitter waters, or by sulphate of soda; whatever will act mildly, quickly, and without irritation, will keep him in a very different condition from that which is associated with habitual constipation. On the other hand, drastic purgatives produce great discomfort, and are to be avoided.

I will devote the few minutes which remain to the consideration of those cases of prostatic enlargement in which the difficulty of passing the catheter is considerable, and where retention of urine is more or less imminent. It is by no means uncommon for a patient who has long been the subject of hypertrophied prostate to be attacked suddenly with complete retention of urine, from the rapid occurrence of congestion and swelling produced by some of the causes above alluded to. The condition is one of extreme distress, often, indeed, of imminent danger. When called to treat such a case it can rarely be a question of waiting, but only of how best to proceed so as to relieve the patient at once. There is mostly evidence of distended bladder in the form of swelling and dulness on percussion above the pubes. You will particularly notice if the swelling is high in the belly and very prominent. I think you would mostly be right in trying first the French coudée catheter; if that failed, the over-curved English, and the same result following it, the well-curved silver prostatic catheter. With this instrument it is easier to avoid false passages which may have been made by the hands of the patient himself, or by others who have failed in a previous attempt. And in using it always remember that anything felt at the end of the instrument like obstruction can only denote that you are not in the right route, or are leaving it. No force is to be applied in such circumstances. The urethra is not narrowed, it may be sometimes a little close and rigid, perhaps, when you reach the prostate; but if you find any obstruction, you should withdraw and find another route, to the right or to the left. But in applying a catheter in these cases, remember that the position of the patient himself is by no means a matter of indifference: I mean only in the presence of signs that the bladder is greatly distended. If these are strongly marked I advise you to pass the instrument with the patient in the lying position. On the other hand, if the bladder is not much distended, perhaps it is as well, or better, to pass the catheter standing, in which position the viscus is more readily emptied. I have known great danger arise in removing a large quantity of water from a patient when in the standing position. I have even known death occur suddenly from this cause. Had I time, I could tell you the history of a case in which a charge of manslaughter was brought against a surgeon in a court of justice in relation to such an occurrence. The circumstances were all well known to me, for I was summoned to defend a brother practitioner, who was unjustly charged in connection with the case. It was the fact that a catheter had been passed in the upright position, and that the patient fell dead from syncope when six pints of urine had passed; just as a patient with ascites might do if you tapped the abdomen in the same position. No doubt it was an error, but nothing could be more monstrous than to make it the ground of a criminal action. It is a very instructive case, and I mention it to show that when the bladder is large, especially in old men, you may have fatal syncope, arising in the way I have described. I always take care, if I find the bladder is very large, to pass the catheter when the patient is lying down. It is advisable also, in these circumstances, to draw off only part of the urine; and after a quart or so has passed, to wait a little before the bladder is completely emptied.

It may be said, 'Why, in describing the treatment of *prostatic* retention have you not mentioned hot baths and opium?' I reply that I have not done so in these particular circumstances, because they by no means favour the hope of good results from delay, or from expectant treatment; and furthermore, it is necessary to have regard not only to the present state, but to what may be the future condition of the bladder, after the emergency has disappeared. Thus, it is by no means unlikely that if the bladder is permitted to remain over-distended, say for a day or two, it will not readily contract again. In the case of an old man's bladder, thoroughly distended by long retention, it is very likely not to recover its powers. Although the patient may have made water fairly up to the time of retention, if you leave him to the influence of opium, hot baths, and treatment of that kind, and the bladder is permitted to distend meantime, you will very likely have more serious chronic retention afterwards than if the instrument had been used at the outset.

Again, if you have had a great deal of trouble in passing the catheter, I suppose you had better leave the instrument safely tied in; but it is not always the most desirable course in these cases. If there is not much difficulty you should rather withdraw it, and use it again; because the prostate is irritated, perhaps injured by an inlying catheter. Unlike stricture, which is often well treated by an inlying catheter, the prostate is always more or less disturbed by it; but less harm accrues from a flexible than from a silver instrument. Better still if you can pass a vulcanised india-rubber catheter, which is the only one which lies harmlessly in the urethra in a case of prostatic enlargement. It may sometimes be insinuated by a series of short, quick pushes, thus [illustrating the method]; or, failing in that manner, by mounting it on a stylet of any curve which may be desired, and subsequently withdrawing the stylet. It is not difficult to keep it in its place if properly tied-in, using the supra-pubic hair for the purpose, as you have so often seen (*see* Fig. 11, p. 26); and the instrument has the merit of rarely becoming encrusted with phosphates, while its flexibility permits the patient to move about his room. A short metal tube within the stem renders it more secure; or the upper five inches may be stiffened by coating it with collodion, and it can then be easily secured by tying-in. Some have been made with 'wings' at the vesical extremity in order to retain it in place, but these mostly irritate the urethra and increase the difficulty in passing it. In short, the vulcanised catheter is sometimes of great service.

After a severe attack of retention of urine, and when the patient has recovered from the fever or shock which often accompany it, we become anxious to observe if the bladder is regaining power, or whether this is entirely lost, or whether the hypertrophied prostate will constitute in future a complete barrier to the outflow of urine by the natural efforts. The inlying catheter being removed, we shall soon discover if catheterism is necessary, and if so, how often it must be resorted to. If any considerable quantity of residual urine is retained, it usually appears to be cloudy and decomposed, and associated with some symptoms of chronic cystitis, often spoken of in these circumstances as 'catarrh of the bladder.' A consideration of the questions which arise in connection with the need of daily catheterism for such cases is sufficient to occupy us at the next lecture.

LECTURE VIII.

RELATIVE TO THE EMPLOYMENT OF CATHETERISM FOR HABITUAL RETENTION FROM HYPERTROPHIED PROSTATE.

We discussed at the preceding lecture the phenomena associated with Hypertrophy of the Prostate, and especially referred to that one which is almost invariably the chief result of this organic change of structure in the organ—namely, an inability, either partial or complete, to empty the bladder by the natural efforts. This inability exists in very different degrees in different cases, and is associated with other circumstances which have an important bearing on the treatment to be pursued. In almost all cases the treatment will sooner or later consist in the employment of artificial means of removing from the patient the 'residual' urine. We will therefore commence the consideration of this subject by proposing the question: 'What are the circumstances which should determine us to employ habitual catheterism for a patient whose hypertrophied prostate prevents him from emptying the bladder by his own efforts?'

I reply that there are at least two principal facts relating to the local symptoms which must be noted in arriving at a judgment for any particular case. Firstly, we must know the amount of 'residual urine' habitually present—that is, the quantity left behind in the bladder after the patient has passed all he can by is own efforts; and, secondly, we must serve the degree of frequency, by day and by night, with which he passes water, but especially during the latter period.

In reference to the first particular, the amount of 'residual urine,' you will of course not always judge from one trial of the catheter. Where there is nothing to disturb the function of micturition—and it is very easily disturbed, as by the presence of a stranger, or by the requirement to perform the act for purpose of experiment when a natural want is not present—the amount of urine left in the bladder is pretty uniform on each occasion of micturition with most patients; the conditions just referred to often temporarily impairing the expulsive power, and rendering therefore the residual portion on the occasion of examination rather larger than usual. This understood, let us suppose a case in which eight ounces always remain behind. That quantity suffices, in my opinion, to make it desirable that the patient should at once commence the daily use of the catheter.

But you may find a much smaller quantity; and you are entitled to ask me—indeed, I expect you to do so—'What is the point in regard to quantity at which the line is to be drawn? When can I say, With this quantity a catheter is quite unnecessary; or, With such a quantity there is no doubt the catheter must be used?' No answer can be given to these questions.

The data from which to form a correct judgment are not contained within the terms of the proposition. Other facts are to be ascertained. I have heard it laid down, indeed, as an axiom, that so long as the urine is clear, no matter what the quantity retained, no instrument ought to be employed. A certain amount of *à priori* reasoning may be urged in behalf of such a rule, but it will not bear the test of large experience. The problem presented for solution in this, as in most other cases where surgical interference is imminent, is far too complex to be solved by one unvarying rule. Like the statement respecting quantity referred to above, the single fact that the urine is clear does not suffice to govern your decision. A large quantity of residual urine, much more than a pint, may exist, clear and acid in certain cases, but which, nevertheless, as we shall hereafter learn, ought certainly to be drawn off by catheter.

But let us see what this rule of never withdrawing the urine while it is clear means or involves. It means neither more nor less than waiting for the occurrence of chronic cystitis before we use an instrument! No other inference is possible. And why should we wait for chronic cystitis?—a condition which of all others it is highly desirable to avoid in an old and already incompetent bladder, and which will sooner or later produce thickening of tissues and loss of extensibility on the part of the organ. Is it not, on the contrary, the very condition we desire to avoid, and do mostly avoid, by commencing the use of the catheter at a sufficiently early period? Of course I know full well that in past days, when catheterism necessarily meant the use of the large metallic instrument, often painfully passed, to say the least, chronic cystitis was an ordinary and frequent result of catheterism. But it rarely is so now, with the soft and flexible intrument of moderate size, if only it is used at an early period in the case, and before considerable accumulation of urine has taken place; the removal of a large quantity being mostly, I do not say invariably, followed by local and general disturbance. For it is not very common to find a patient whose residual urine has, from neglect of catheterism at an early period, reached the quantity of twenty ounces or more, who does not suffer somewhat severely from both chronic cystitis with purulent urine, and febrile attacks with resulting debility, whenever the daily use of the catheter has to be commenced. Furthermore, at this advanced stage of chronic retention, a slight accident of some kind readily occasions complete retention, or nearly so; and then it is no longer a question of using or not using the instrument, since the condition is now one which imperatively demands a catheter. In these last-named circumstances, chronic cystitis is almost sure to follow—an occurrence which most probably would not have taken place had there been an earlier resort to the instrument. And so it happens, in the management of these cases of continued and chronic retention due to slowly advancing hypertrophy of the prostate, that the longer the use of the catheter is postponed after the early stage of the malady is passed, the worse will be the symptoms. And it happens also, unhappily not seldom, that these serious symptoms following the use of the catheter bring undeserved discredit on the surgeon who first employs it—a discredit really attaching solely, and very gravely too, to the adviser who unwisely prevented an early resort to its aid. So that I beg you to understand that with a quantity of habitually retained urine amounting to eight or ten ounces, whether it be thick or clear, there is no question in a vast majority of cases that the time for the catheter to be used at least once, probably twice a day, has arrived.

But what other circumstance has also to be taken into account? A very important one—viz., the frequency with which the patient passes urine, and which differs greatly in different cases. It is much more to the purpose for your decision to note whether the patient is disturbed six times in the night or only twice, than whether his urine is clear or cloudy, or even whether the residual urine amounts to four ounces or to twelve. If you find him affected by loss of rest—one of those things which sap the foundations of life in elderly men—pass the catheter the last thing at night for him, and mark the result. If he obtains four or five hours of continuous sleep after the bladder has been emptied—a common occurrence—you have reason enough for persevering, and he will learn to use the instrument himself every night, and will be exceedingly grateful to you for the relief he has obtained. So also the avoidance of pain and spasm achieved by this treatment—a result which is often to be noted —renders the catheter highly desirable, whether the quantity drawn off be small or large, transparent or clouded by mucus.

Taking into consideration these different phenomena, which vary so widely in different constitutions, you will have no difficulty in arriving at a correct judgment for each individual case, provided you give to each sign or symptom its due importance, and do not rest your decision on any one in particular, unless that one—in regard of quantity, for example—is sufficiently marked to leave no ground for doubt as to your course.

I revert to a fact, already alluded to, which is one of considerable importance, that although the urine may have been quite clear before the catheter was employed, yet in some instances, after its habitual use has been continued for a short period, the secretion becomes cloudy, and the patient is feverish and unwell. A stage of constitutional derangement, more or less marked, has sometimes to be passed by those persons who, having long experienced difficulty, suddenly change from their usual mode of micturition to the artificial one. It requires some judgment, as I have already pointed out, to decide when this change should be made, but having made it, the phenomena described occur in a few exceptional instances; and this fact you should be aware of, and you should watch the result of the daily catheterism. Sir Benjamin Brodie was the first to remark it, and in his valuable lectures called attention to the circumstance that patients might even sometimes gradually succumb with symptoms of low or irritative fever a few weeks after beginning to use the catheter. Bearing this in mind, our mode of proceeding may be advantageously modified in relation to those patients whose amount of residual urine is large. It is then undesirable to empty the bladder completely on every occasion of catheterism during the first few days. If the patient has been in the habit of retaining perhaps a pint of urine, or even more, after he has made water, it is a serious change for the bladder to be suddenly and completely emptied two or three times a day; the organ soon becomes irritable, the urine is charged with pus, and the patient loses appetite, becomes feverish, and there is sometimes considerable danger to life. The rule under such circumstances is to proceed cautiously. Instead of removing the entire quantity, leave some urine behind; and thus a compromise is made between the exigencies arising in this condition of the bladder and the usually absolute rule that it should be emptied. Draw off half or only two-thirds of a pint; you will thus relieve the organ partially, and in the course of a week or sooner you may gradually accomplish the entire emptying of the bladder, and all will probably go well. And it conduces greatly to success to permit no outdoor movement to such a patient, but to confine him to his room, in a warm temperature, if the weather be cold, or even to his bed for a few days. The probationary period, while the use of the catheter has to be learned, and the onset of chronic cystitis with constitutional disturbance, is to be feared, is more safely passed if absolute rest and quiet are accepted as necessary conditions by the patient. It is only within the last few years that I have pursued this course, and I cannot speak too highly of the results. Nevertheless, very rarely, notwithstanding every precaution, you will find a case in which during this process the tongue grows slowly more red, dry, and contracted; the powers of life gradually fail; the senses become impaired, and the patient sinks. You will always find in such cases, if an autopsy is made, old-standing pyelitis, with dilatation and marked degeneration of the renal structure, and you will know that in no circumstances could the patient have long survived.

LECTURE IX.

RETENTION OF URINE.

GENTLEMEN,—Retention of urine is our subject to-day; and if we at all realise what the condition of a patient is who experiences complete or almost complete retention, accompanied as it is by severe pain and great anxiety, we shall feel how important it is to relieve him, not only as easily, but as quickly as is possible. And there are very few cases in which you will meet with more gratitude if your treatment is skilful and prompt. For not merely are the patient's physical sufferings extreme—and I suppose every man who has been so situated as to be unable to relieve a distended bladder, even for a short time, has had some glimpse, though only a faint one, of the distress occasioned by inability to pass water for several hours, or even days—not only, I say, is the pain intense, but there is extreme anxiety of mind also. He fears that the bladder may burst (a circumstance, however, of exceeding rarity), and he always looks forward with gloomy forebodings to the consequence of not obtaining relief.

Now, while retention of urine is very common in the hospital, it is not so in private practice. The circumstances of exposure through the more hazardous callings of the men who become hospital patients, determine this difference; when, therefore, retention is met with among the higher classes it is always a very grave matter, and in all circumstances, wherever encountered, will exercise your highest skill and judgment. Then, again, if you are successful, the relief which you afford is instantaneous. It is not like the questionable result of a dose of medicine, which a sceptical patient may persist in attributing solely to our great ally—the curative power of nature. There can be no uncertainty as to the result of the treatment if, after twenty-four hours of agony, relief follows your dexterous use of the catheter, and when the two or three pints which the patient was unable to void are withdrawn by your hand. He tells you that he is in 'heaven'—a common expression with such patients—and he never will doubt for a moment that you were the author of his 'translation.'

Retention comes before us in three typical forms, each requiring a different species of treatment. There may be some instances which cannot absolutely be so classed, and some the characters of which belong equally to two forms; still, for convenience, it is well to adopt this classification.

First of all, you may have retention occurring in a young and healthy man who has no stricture, but who is the subject of temporary local inflammation; next, it may occur in an older man who is the subject of confirmed organic stricture; and, lastly, it may occur in a man who is neither young nor hale, and who has no stricture, but has an enlarged prostate. Of the last I have nothing to say; we have already discussed that subject, and the mode of relieving retention in connection with hypertrophied prostate. But I shall ask your attention to the two other conditions—namely, retention from inflammatory swelling, and retention arising from organic stricture.

With regard to the first kind, you will probably learn a history something like the following:—Within a month or six weeks the patient, who is generally a young man, has had gonorrhœa. He has obtained considerable relief from treatment, and has in consequence allowed himself some relaxation of the regimen to which he has been lately submitting. Thus, perhaps, he has recently indulged in the use of alcoholic stimulants, has taken some unusual amount of exercise, a game of cricket or the like, and, after being over-heated, has been sitting on a cold stone or damp grass; or, lastly, he may have exposed himself to some strong emotional excitement. Under those circumstances, what has been called 'inflammatory stricture' may be produced. Now let me say, repeating what I have said in a previous lecture, that that condition has no right to the name of stricture. An inflammation affects the prostatic region of the urethra, and involves therefore the neck of the bladder; a region in which you know stricture is never found. The result of this soon is, some fulness or swelling of the prostate, as may be ascertained by rectal examination, a condition not in the least resembling stricture—that is, it is not a circumscribed narrowing at a particular part of the passage, but a tumefaction of the gland, which more or less closes the canal, and prevents the expulsive apparatus of the bladder acting and discharging its contents. Such is usually the condition in what is called inflammatory or spasmodic retention.

This condition of the prostate resembles that which affects the tonsils, and which we call inflammatory sore throat. Both complaints consist in the enlargement of glands which more or less surround narrow passages, and which thus interfere with the functions of those passages; both occur rapidly, and may be produced by unusual exposure to external cold.

Now, what are the early signs of inflammatory retention? First, there is usually some cessation of the gonorrhœal discharge. Just as in the case of orchitis, where the urethral inflammation is supposed to subside and to attack one of the testes, the inflammation of the prostate is similarly associated with diminished discharge, and if you examine by the rectum, a tender and swollen condition of the prostate will be discovered. Then the stream of urine grows smaller and smaller, and in a very short time the patient loses altogether the power to relieve himself. He is feverish, restless, and suffers severe pain about the lower part of the abdomen and in the perineum. Those who are the subjects of stricture may have become in some measure accustomed to difficult micturition, but when an active young fellow is thus attacked for the first time, he is in a state of extreme distress.

Now, as to the treatment of such a case. The patient desires ardently to be relieved immediately, and declares he cannot endure his sufferings. You see him bent nearly double in order to relieve the pressure of the abdominal muscles on the bladder, and he is even breathing shortly and quickly to avoid their action there. The old treatment in such cases —the classical treatment of forty years ago—was bleeding from the arm or peri- um, repeated hot baths, and large es of opium, so as to enable the patient to bear the pain and dispense with the catheter. The reason assigned was, that in an inflamed state of the canal, you might do more harm than good with a catheter, and that it was therefore better to mitigate pain by the means described. I have told you that I dissent from that treatment altogether, although it is still employed to some extent. For, first, you must not only regard the present emergency, but also the possible occurrence of serious after consequences; for if a young man is allowed to remain for thirty-six or forty-eight hours with an unrelieved bladder, because you fear to use an instrument, permanent mischief may be done. I have seen patients who have been unable to empty the bladder for years after treatment of this kind. Extreme and continued distention of that organ sometimes destroys or permanently diminishes its contractile power, and produces a condition which is properly termed 'atony of the bladder.' Therefore, if you pass the catheter, even at the risk of doing a little mischief to the urethra, I am disposed to think you would be wise in incurring that little risk rather than expose the patient to the other danger. But then it ought to be done without such risk.

For my own part, I always take a small flexible catheter—one not above No. 6 (English scale), as a large one gives in these circumstances unnecessary pain—which has been tolerably well curved in the way I have before described, since it has to enter over a swollen prostate. Or, you may use a French one with a bulbous end, or with the end 'coudée.' With the latter instrument especially there is generally no difficulty in relieving the patient, who is exceedingly grateful for what you have done; whereas, if you put him through the long process, and he relieves himself ultimately, he thanks you for little, comparatively speaking, and he runs the risk to which I have referred. But lastly, in the event of flexible catheters not passing, you should try a silver catheter of the same size.

I believe one of the first persons to denounce the old plan of bleeding and hot bathing was the late Mr. Guthrie. If you turn to the racy writings of that experienced and practical surgeon, you will find an anecdote in connection with this subject. He relates the account of a visit which he paid to a patient in the circumstances of retention I have described, and also the reasons, in strong and graphic language, why he then gave up for ever the bath and bleeding practice, and passed the catheter at once for such cases in future.

So much for the inflammatory condition of the prostate producing obstruction to micturition. I need not refer at any length to spasmodic retention, which rarely happens. At the same time it may be admitted that there is no doubt that when an inflamed condition of the urethra exists, spasm of the muscles may co-exist; but the precise share which each takes in contributing to the result will not influence the treatment.

Now I come to the second form of retention—viz., that depending upon organic stricture. Here we generally have to do with an older man, because it is rare to find a young one suffering from confirmed organic stricture. As a rule, to which there are exceptions, such a patient mostly has stricture ten or twelve years before he is the victim of complete retention. First of all you have to ascertain that the cause is certainly stricture. You will probably find that he suffers less acutely than the patient just described, although his condition is a painful one; for the progress of the case has been more gradual, and the derangement has not necessarily been brought on by any great or sudden imprudence. He has been passing water with difficulty for weeks or months, and at length some slight cause perhaps has produced almost absolute retention; the 'last ounce,' so to speak, 'has broken the camel's back.' Or it may not be absolute retention as before; there may be some dribbling, indeed the patient may have been relieving himself in that inefficient way for days, but the bladder is greatly distended, and to all intents and purposes his case is one of urgent retention. You find probably also that the patient is accustomed to instruments. Now, what you have to do is to take an instrument of middle size, and pass it down to the seat of obstruction, in order to learn where it is. You will probably find it four or five inches from the external meatus. You should then take the finest gum catheter and endeavour to insinuate it into the bladder, and if you are sufficiently fortunate to accomplish this, you should tie it in at once, so that you may have no further trouble. But that is not a very difficult case of retention. Supposing you are unable to pass the gum catheter, I should then recommend a small silver one, either No. 1, or smaller, and use it in the manner I described to you in Lecture V. Notwithstanding all your skill, and that, perhaps, of friends whom you may have called in, the instrument is still not passed. There may have been false passages (it is very easy to make them), and there may be such difficulty that it is almost impossible for any one to pass a catheter after your failure.

We then come to the question: What is to be done next? No doubt for some of these cases much may be effected by opium and hot baths. Suppose the water is dribbling off, and you shrink from the last resource—that is, puncturing the bladder, or other operation to relieve the retention of the urine—a safe middle course may still exist for some of these cases. The patient up to this time may have been exposed to cold; if so, he should have the benefit of a warm bed and hot baths, with large doses of opium —and you must be very liberal with opium if you use it at all—so as materially to mitigate the involuntary straining, which he can no more help than he can help breathing, and which is utterly unsuccessful as regards the contents of the bladder, often making matters rather worse than better. The result may be that the water will dribble off more freely than before, and you may find, after two or three days, that it will come in a larger stream, and that then you can pass the instrument without much difficulty. The patient may often be saved an operation thus, if there are grounds for declining to perform it. On the whole, however, I do not advise waiting very long; still it is better that the patient should be temporised with in that way than that he should be damaged by an unsafe hand, either with knife or catheter. Most men, indeed, are quite sufficiently confident in their ability to use instruments when they have a patient that cannot make water. Still, if you are convinced that you are not doing any good with the catheter—still more that you are doing mischief—you can in most of these cases successfully employ opium or an inhalation of ether, with hot baths and fomentations—that is, as regards the immediate and urgent condition.

But we will assume that yo

done all that you can do in this way, and that the question of relief by some other means must be met. The bladder is increasing in size, notwithstanding your treatment. You examine the supra-pubic region carefully, and find a tense and perhaps large tumour there, reaching to the umbilicus, or nearly so, more like a uterus than a bladder. Now, a method has been devised within the last few years, by which you can at all events easily, speedily, and safely afford temporary relief. I refer to Dieulafoy's capillary trocar and exhausting syringe. By means of a puncture above the pubes, the distended bladder may be emptied when the condition described has been reached, or even sooner if thought necessary. And it is an operation which may be repeated, daily a few times during an emergency, affording time, possibly, for the stricture to become less tight and for a catheter to be introduced. But if this treatment does not meet the exigencies of the case, a more permanent opening into the bladder must be made by some other operation. Furthermore, it is not to be forgotten in examining the patient with this view, that in some old cases of stricture there is not necessarily large supra-pubic dulness, for the bladder is thickened and contracted. Introducing the finger into the rectum, a swelling there may be found, produced by the distended bladder, and here you are to seek the sensation of fluctuation. If, placing my hand above the pubes, I feel a distinct wave communicated to my other index finger in the bowel, I know that to be a point at which the trocar can be inserted with safety; and if a well-marked rounded tumour over the pubes which is dull on percussion does exist, with the bowel-note around it clear and distinct, I have reason to believe that an operation over the pubes would be successful. But then another question naturally arises: Why not attempt to relieve the bladder by a dissection to the urethra itself from the perineum, so as, if possible, to cure the stricture, and at the same time relieve the bladder? Might it not be wise in this manner, as it were, to kill two birds with one stone, and not to be content with merely puncturing the bladder by the rectum or above the pubes?

At this point let me revert to the *different practice and different* experience of surgeons in relation to this matter. Let me give you the experience of the late Mr. Liston. He once said, from this chair, that during the whole of his connection with the Royal Infirmary of Edinburgh, and subsequently with this hospital up to the time at which he spoke—namely, three or four years before his death—he had never punctured a bladder for retention of urine. On the other hand, there are men living in this town who have punctured a bladder fifty times or more. Mr. Liston intended to imply that a good surgeon ought rarely to find it necessary to resort to any other means than the catheter in circumstances of retention. But do not suppose for a moment that the gentleman I spoke of who has punctured a bladder fifty times, does so because he fails to pass the catheter under those circumstances; he operates thus because he thinks it wiser to puncture than to persevere too much with the catheter. Then, again, both Liston and Guthrie occasionally performed the perineal operation just spoken of. From the perineum the urethra *may* be reached behind the stricture. Now, without entering into a long discussion on the subject, I may say that this mode has lost favour of late years. It is no easy thing to find the urethra behind the stricture; and a man may make a serious wound in the perineum, and never arrive at the urethra at all. Then it does not follow that it should be necessary to divide the obstruction, so far as its cure is concerned; for the stricture, when the time comes to treat it, may be amenable to dilatation. The reason why puncturing through the rectum has been done so often by Mr. Cock, of Guy's Hospital, is that he conceives it to be an excellent kind of treatment. He says: 'Let us withdraw the urine from the urethra altogether for a few days, and the urethra will recover itself, so that we may be able to cure the stricture with ease.' And that is often true. He punctures the bladder by the rectum under the circumstances I have mentioned; and this is his instrument for doing it. On his system, all the water passing by the rectal tube, the urethra is lying fallow, so to speak; and in a short time the instrument can be passed—say No. 2, or 3, or 4 catheter, although before you could not pass No. 1. This, then, is a species of treatment of stricture which Mr. Cock has introduced;

and, at all events, he has proved how easily and safely this operation may be performed: he has, in fact, familiarised us with a proceeding which before was often supposed to be a hazardous and serious affair.

My own experience of puncture of the bladder for retention of urine, is, for prostatic enlargement twice, and for retention from stricture, four times, besides using Dieulafoy's instrument twice only: this is during a period of above thirty years. One of the former was a supra-pubic puncture, all the others were by the rectum; on all other occasions I have succeeded by means of the catheter. I should add, that two of the rectal punctures were on the same individual, once in 1859 and again in 1870, he particularly requesting me to operate on the latter occasion as I had done on the first, because the relief was so speedy and complete. But for this circumstance it is almost certain I should have succeeded with the catheter. No doubt the rectal puncture is the safest operation in most cases when the bladder has to be opened. On the other hand, a very considerable enlargement of the prostate makes the supra-pubic operation necessary. In the one case in which I did it for retention, the prostate filled the pelvis: it was the largest I ever saw: the bladder had long been emptied only by a fourteen-inch catheter, and with difficulty.

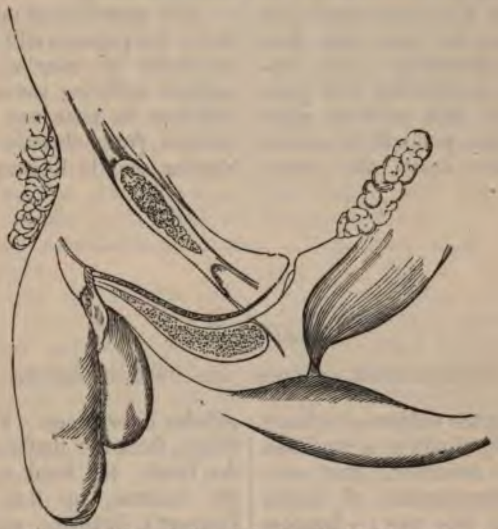


FIG. 33.—A section of the pelvis showing bladder and rectum.

Following a suggestion made many years ago, I once punctured through the pubic symphysis—a method I shall not further allude to—and failed to find urine.[1] I punctured immediately after by rectum and gave relief, the patient recovering.

There remain then for consideration the puncture by the rectum, and that above the pubes (*see* Fig. 33). By carrying into the bowel your finger—a reasonably long finger—you arrive at a point just behind the prostate. The other hand is placed above the pubes, that the wave of fluid, by its pressure, may be distinctly felt by the finger in the rectum. You are then quite certain of what you are going to do. Along this finger, kept firmly in place, your trocar is slipped, and then boldly, but carefully, pushed into the bladder. This is always an anxious moment, because, if you have not hit the bladder, it is a serious matter to have thrust this long instrument into the centre of the body and to find no urine escaping. The best position for the patient is sitting on the edge of a bed, his back supported by pillows behind, the legs apart, each on a chair; an assistant by him placing or hand on either side above the pubes, so as to steady the bladder, and press it down towards the rectum. It is well to remember, that if the canula slips out subsequently, you will not be able to get it into the same opening again. The muscular fibres of the bladder instantly close, and you have to make another puncture—not a matter of much consequence, but better avoided.

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[1] It may be as well to state what was the probable cause of the failure. A puncture through the symphysis, which is solid bone in an elderly man, blunts the trocar so much that when the point arrives at the soft tissues and bladder on the other side, it will not penetrate but pushes them away. At least this is what happened in three experiments I made on the dead body, for the purpose of observing the result.

For the supra-pubic operation you divide the structures in the middle line until you reach the linea alba. Then carefully making your way deeper, you will soon discover fluctuation; and having the bladder steadied as before, you will thrust the trocar slightly downwards. In this case you retain the silver canula for two or three days; but you may soon substitute a gum instrument. Now, supposing there is a probability that your patient may require this artificial relief by tube for some time, you will, of course, prefer the situation above the pubes, because it is much more easy to wear the tube there than it is in the rectum, where it interferes with the functions of the bowel, and is otherwise much in the way. I have known patients who have passed all the urine through a tube above the pubes from ten to fifteen years, having been punctured for stricture, and who led active and comfortable lives in consequence, the urethra being completely obstructed. One of them, who had suffered greatly before, and was now in perfect comfort, told me that 'he did not know whether this mode of passing water was not preferable to the original one!' That, however, I conceive, is quite a matter of taste.

The operation of opening the bladder above the pubes is still further considered, especially in relation to the relief of patients suffering severely from habitual inability to pass any urine except by catheter, from chronic cystitis, contracted bladder, &c., in Lecture XX.

LECTURE X.

EXTRAVASATION OF URINE AND URINARY FISTULÆ.

Before commencing the subject of urinary fistulæ, I shall briefly allude to a condition closely related to retention, just considered — viz., extravasation of urine. And it is related in this way:—Suppose that from bad treatment, neglect, or otherwise, the patient suffering with retention from stricture has had no relief, and that when you are called to see him, the question of puncturing the bladder no longer arises, since the urethra has been already opened by natural means—that is, Nature has herself taken a step towards accomplishing a cure; clumsily and roughly it is true, but she has nevertheless made an effort to preserve life. And, undoubtedly, although it is true that many subjects of stricture or retention, without surgical aid must therefore certainly lose their lives, nevertheless a few are saved by extravasation of urine taking place. What then happens is, that a portion of the urethra gives way behind the stricture, perhaps during some violent act of straining, and through the rent so made, a quantity of urine is driven with great force into the cellular interspaces. You know of course where, from the anatomical disposition of the fascia, the fluid must go—viz., into the scrotum, up into the groin above Poupart's ligament, rising upwards over the belly. Occurring, as it usually does, in the bulbous part of the urethra, where the walls of the canal are weak, the urine cannot pass backwards behind the scrotum, or the back part of the perineum; neither can it get into the thighs, because it is checked by Poupart's ligament. I have seen it rise as high as the chest, and I have made incisions to evacuate it, in a severe case of extravasation, as high as this point. When, therefore, this accident has taken place, it follows that at every action of the bladder more urine is driven out with force, so that the cellular interspaces are separated, and the fluid gradually finds its way upwards.

Generally, you ought to know at once, by the appearance of the patient, what has happened, although it is possible sometimes to confound the condition I speak of with ordinary inflammatory œdema of the scrotum, for extravasation may commence gradually and insidiously. In ordinary cases, you see a hard perineum, a large red tense scrotum, the penis greatly swollen, and a red blush perhaps rising over the pubes. In order to ascertain the true state of things, you must ask for the antecedents, and you will probably learn that there was great difficulty in passing urine, followed by rather sudden relief. When a man has had retention for some days, and extravasation suddenly takes place, instant relief is experienced—the frightful want to make water disappears as soon as the fluid finds its way into the scrotum; but he soon feels new pains, not necessarily very severe, and what is worse, constitutional symptoms rapidly set in. The poisonous fluid quickly destroys the cellular tissue, so that sloughing soon begins. After forty-eight hours or so, gangrenous discolorations appear, and the urine may find its way into the corpus cavernosum, when a dark spot appears on the glans, showing that the structure of the penis itself is infiltrated, and that mortification of a portion has taken place.

Without describing further this condition, which you must have seen for yourselves, and which may be seen now to some extent in a patient in the ward upstairs, let me say, do not in such a case be afraid of the knife. You have no occasion for a catheter; the urine has found its way into the cellular tissue, and you must let it out as freely as possible. On each side of the perineum and scrotum make a deep incision. You need not limit the incision to two or even three inches, because you are really cutting into urine, not into flesh. The structure is so enormously distended, that there is but little flesh to divide; and although the incision may appear very deep and long, when the water has run out, the wound will be comparatively small. The incisions generally bleed rather freely at first, and, from three or four, a patient may soon lose a pint of blood. The urine runs out also, and as the distention goes off, the vessels contract better; but if you see any little vessel spouting, tie it at once. An incision should be made on each side of the penis, because there is not sufficient communication for an incision on the one side to relieve the other. Do not be extravagant in these incisions; still it is better to err on the side of freedom than to be too niggardly in the use of the knife. The next day, if the case has done well, you will find the scrotum much reduced in size, and the parts altogether much less swollen and inflamed. You have now a direct communication through the cellular tissue from the bladder, by means of an opening from the urethra behind the stricture, and you will, as a rule, be safer without a catheter, and permitting the water to drain off. What happens? Why, just what happens after puncturing the bladder. When the urine flows by another passage, the urethra begins to improve, and in three or four days you will probably have no difficulty in passing a No. 3 or 4 catheter. Patients even with very considerable extravasation, prostrated as they are when you see them, if promptly treated by the knife, and well supplied with nutriment and some wine, often exhibit striking and rapid recoveries. The whole scrotum may slough away, and the testicles may be seen uncovered in the wound, and yet all may heal up soundly and well.

This leads us to the next subject. After the exit of the urine by these artificial channels, some of them fail to heal, and remain patent, and thus form what are termed urinary fistulæ. Let me remind you that this day week there were in my ward three patients illustrating this condition, rather exceptionally obstinate cases. One was caused by extravasation of urine, and the other two by the more usual and common cause—stricture of the urethra.

We have spoken of extravasation as a cause of fistula; but how does stricture give rise to it? Thus: in some patients, when a stricture has existed some time, and has had no treatment, or bad treatment, it is not uncommon for chronic abscess to form, say in the perineum, between the urethra and the surface. In time this opens externally, and a few days afterwards a little urine finds its way through it, and passes at each time of making water. If no relief is afforded to the patient, another abscess forms; and so several sinuses may arise, and other openings in various and surrounding parts, all giving exit to the urine. These fistulæ may take place in a great number of situations, such as in the penis, in the scrotum, in the perineum, in the groin, and in the rectum; but the two latter situations are very rare.

We will consider the first four by themselves, because fistulæ which open into the rectum require a different treatment altogether. Then, respecting their specific characters, I shall make three classes, examples of which may be found in any of the localities named.

First: Fistulæ may consist of simple openings or channels between the urethra and the external surface.

Secondly, they may be surrounded with inflammatory induration, which is an obstacle to their healing.

Lastly, they may be complicated with loss of substance from sloughing, so that even a portion of the urethra itself may have been destroyed; and these are the most difficult cases to deal with. Hence these fistulæ classify themselves naturally as simple, indurated, and fistulæ with loss of substance.

I. I will deal briefly with the 'simple urinary fistula.' First, I beg you to observe that whatever part of the canal it is connected with, fistula mostly heals, if the stricture with which it is associated is dilated. Patients, especially in private practice, are often extremely anxious about the result of an opening in the perineum or elsewhere through which any urine passes; and it is right that you should assure them that if the stricture is thoroughly dilated, the unnatural passage will almost certainly heal of itself. But there is an important point to be considered in connection with this subject—viz., the quantity of urine passed by the fistula, compared with the quantity passed by the natural passage. Of course the gravity of the affection depends very much on the relative proportions passed by the two ways. Usually the greater part of the urine passes by the right way, and one-fourth or less by the wrong passage. If a large quantity—say three-fourths—passes by the unnatural opening, then probably a considerable amount of obstruction is present. Nevertheless, as the stricture is dilated, you will see that the proportion of urine passing through the fistula gradually diminishes and finally ceases as the sinus soundly heals; but this latter result is achieved only on the condition that the stricture is thoroughly dilated.

II. We come to fistulæ which are associated with much inflammation and induration in the perineum. These may e multiple; in which case you may frequently find five or six openings. I have known a man with twice as many, so that instead of the urine being discharged by one stream, it flows as from a watering-pot. Even this condition very much improves as the stricture is dilated, and may thus get quite well; but this is not always the case. Then there are some instances looking less formidable, like those now in the ward, with perhaps only two or three fistulous openings, through which the greater part of the water has passed for a long while. You recollect that we fully dilated the stricture in each case; but still no improvement as regards the flow of urine through the fistulæ took place. A No. 12 catheter was passed; but the patients were not cured. The condition of the perineum improved very much; but still more than one-half the urine obstinately held its erratic course through the perineal openings. Now, what is commonly done in such circumstances? Usually operative proceedings of some kind are resorted to; or, if these have been postponed or rejected, a rather tedious process has been employed. The principle laid down—and I have myself applied it successfully—is, that it is necessary to take care that the external openings of the fistulæ should be very free, and to ensure this condition, either by means of the knife, or by potassa fusa, or by some other means; so that the urine may not be detained in its course from the urethra to the external surface, causing fresh induration or thickening. When this has been done we should revive the internal surface of the fistula by introducing a hot wire, or a solution of cantharides or of nitrate of silver. No doubt this treatment sometimes succeeds; but it is at best a tedious process.

Then it was sometimes attempted to cure such fistulæ by tying-in a gum catheter for a period of weeks, or even of months, with the view of transmitting the urine from the bladder to the surface without contact with the urethra and fistulæ. But this plan generally fails; and for this reason: that urine always finds its way by the side of the catheter, along the urethra, and so into the fistulæ by the force of capillary attraction or otherwise; and disappointment was almost invariably the result of such treatment. The practical surgeon soon discovers that tying-in an instrument never ensures the transit of all the urine through it; some will always escape by the side and defeat his purpose. I have, therefore, adopted the plan of teaching the patient to pass the catheter himself and use it for every act of micturition; and this is by far the most rapid and the most certain method. With regard to the two cases upstairs, ten or fifteen years ago I should have applied potassa fusa or the galvanic cautery, or something of that kind; but the fistulæ have soundly healed, through ensuring, by using the catheter every time the urine is to be passed, that the current should cease altogether to pass through the fistulous passages. You will first teach the man to pass a No. 7 or 8 gum catheter—an easy matter enough. He then agrees to pass it every time he requires micturition, night and day. On no occasion is he to permit the urine to flow spontaneously—say, during five or six weeks—not even when he goes to stool; and this is avoided by always using the catheter immediately before his bowels are opened. That plan has been followed in each one of the three cases in question without difficulty and with perfect success; for each man has a sound perineum, and has now relinquished the use of the instrument.

III. We arrive at the third form of fistula, that in which there is loss of substance. This class must be dismissed rather briefly, because its full consideration would involve a tedious detail of many different surgical procedures. Where you have this loss of substance, a plastic operation of some kind is generally required, to fill up the gap which exists. When the opening is small, you may contract it very materially by the heated wire or galvanic cautery, or by any mode which tends to produce a contraction of the tissues. You know that cicatrices which result from burns contract considerably, and you avail yourself of that action in this instance. Most commonly, however, if the soft parts have been largely destroyed, some plastic operation is required for the cure. Thus, on passing a silver catheter, when a portion of the urethra has sloughed away, you may see perhaps a quarter, or a third, or even half of an inch of the catheter exposed in the wound. The successful treatment of such cases demands much care and nice management. They do not often come under our notice, and less often are they completely cured.

I have had in the hospital three or four such cases, but these, by means of plastic operations, have been entirely restored. Some of you saw one last winter —a man who was the subject of a considerable open wound, situated just between the angle of the penis and the scrotum, and showing at least a third of an inch of the catheter, the whole of the floor of the urethra having sloughed away. The operation in that case was one of the most successful I ever saw. The first operation completed it, with the exception of an opening not larger than a pin-hole. What was done was to pare the edges all round, then to raise a flap of skin from the scrotum below, which was brought up to cover in completely the wound, the margins being carefully attached by a number of little silk sutures. That fistula healed perfectly. And why did it heal? Here is the important point: there was one condition necessary, without which it would have failed. A week or two before performing this operation, I made the patient learn to pass the catheter habitually, so as to draw off every drop of urine; and finding him thoroughly expert, I performed the operation; and for a month he never allowed any urine to pass otherwise than by the catheter. Had I tied the catheter in, it would not have been sufficient, because the water, as I have told you, always finds its way by the side sooner or later. Luckily, he performed his part of the compact to the letter for the stated term, so there was no reason why the wound should not heal there as well as anywhere else. The little tiny opening which remained was perfectly closed with the heated wire, and the urethra can now perform all its functions perfectly well. You know there is another very important function connected with this canal, besides that of micturition. I do not know how you may estimate the value of that function, but it is one which may involve very important considerations in cases where the transmission of a great family name or title or estates depends on it. Whether this motive be present or not, there is no doubt that every man conceives the ability to perform that function a matter of importance to himself; and in the case before us there could be no such ability until the abnormal opening had been closed.

If I were to illustrate the subject of urethro-plastic surgery, a lecture or two would scarcely suffice to describe the different kinds of operations which are performed in different spots. I have taken the case described as a typical one. It is one of the most difficult to close. The penis is liable to differences in form: the patient may be troubled with erections, which may damage any operation, and there is often very little flesh to furnish flaps. But in the perineum and scrotum the effect of erection has little influence, and materials for our purpose may generally be found.

A word or two about urinary fistula opening into the rectum. You remember that I made an exception in reference to fistula connecting the urethra with the rectum. There is a case upstairs in which it occurred from the patient himself thrusting a bougie from his urethra into the rectum. More commonly it occurs from prostatic abscess. In these cases, at each act of micturition, urine passes into the rectum—often a very troublesome, even distressing circumstance. The bowel becomes excoriated, and the patient is obliged very frequently to go to stool. I shall say very few words about it, because each case must be treated on its own merits. I will give you the result of my own experience, for I do not know that there are any published records respecting such cases. They are very few in number, but they are very important when they do occur. I cured one case solely by the influence of position. It was the case of a young officer whom I saw in private practice (I have not met with a precisely similar one in the hospital, and must therefore refer to it), who passed three or four tablespoonfuls of urine into the bowels at each act of micturition, after having had some abscesses there which I did not see. It occurred to me, after some wholly inadequate treatment by other means, to tell him to lie down on his face and make water in that position, never allowing a drop of urine to pass in any other way. In a few weeks he was quite cured—very fortunately for him on such easy terms. If you ever meet with such a case the plan is worth trying. I have had two other such cases since, but it has not succeeded. In the successful instance to which I refer, it occurred to me that the force of gravity would carry all the urine by the proper channel. None passed into the rectum, and at the end of six weeks the patient was well. I saw him some years afterwards, and he was *soundly cured. But were I to meet* with a similar case now I should desire the patient to pass all his urine by the catheter, and I have no doubt it would be successful. Unless there is a loss of substance, this method usually cures the patient; but if there is much loss of substance, and, worse still, if the opening is from the bladder into the rectum direct, it is necessary first to examine the opening thoroughly as to its size and situation. Put the patient on his back, as for lithotomy, and introduce into the rectum a duck-bill vaginal speculum, which you must have seen me do, so as to get a good light thrown upon the upper wall of the bowel. If the fistulous opening is sufficiently large to require a plastic operation, I should not hesitate to perform the same operation that is done for openings between the bladder and vagina—that is, to pare the edges, and stitch them together with silver or hard silk sutures—only it is more difficult, as there is less room in the rectum for manipulating than in the vagina. In the vagina there is plenty of space for the work; but I have done it also in the male in one case. I found it possible to do, though difficult; and I believe that is the best plan when these cases occur with loss of substance. If the opening, however, is very small, it may be greatly diminished in size, if not closed, by applications of the galvanic cautery, as I have repeatedly done.

Such a condition sometimes happens after the operation of lithotomy. A lad was here not long ago—many of you remember him—who had been cut in the country some years before with success, except that the rectum had been opened; a fistula had existed ever since, and he was sent up for me to close it if possible. I placed him in the lithotomy position, under chloroform; emptied the bladder by a catheter; and with the vaginal speculum above mentioned we could all see an opening in the upper and left part of the bowel which admitted a number nine silver catheter. Having ready prepared a large double wire connected with a powerful battery, the wire was first shaped and placed within the fistulous canal, and then, the current being turned on, the sides were freely touched with the heated wire. This proceeding was repeated about once a week or ten days, the quantity of urine passed by rectum steadily diminishing. I never, however, could altogether close the track, although

I reduced the rectal urine to a trifle, and so made the patient comfortable. He no longer wetted the bed against his will at night—an occurrence which forms one of the most troublesome features in these unfortunate cases.

LECTURE XI.

ON STONE IN THE BLADDER.

Gentlemen,—I wish to give you to-day a sketch in outline, embracing all the principal points, if I can, of a very large and important subject—viz., stone in the bladder of the adult male. I shall subsequently briefly treat the subject of stone in children, and also that of stone in women.

First of all, in what classes of cases is stone most common? Contrary to current opinion on the subject, it is most common in individuals from fifty to seventy. By writers generally, it is stated to be most common in children. Perhaps it is so if you take the number of cases in children as compared with the number of cases in elderly adults, although this is by no means certain, but not if you take the number of individuals affected, in either class relatively to the numbers of that class living at the time.

I think it may be said that the most favourite period for calculus is from about fifty-five to seventy-five; the next in order is that below puberty, and the most rare period is that of middle age. Treating numerically hospital cases alone, you may put it down as a general rule that half the total number are those of individuals below thirteen years of age. I cannot refer you to any more exact researches than those which were made with great labour some years ago by myself. Out of 1,827 such cases, each one of which was reported to me in writing, and of which I knew all the principal particulars, one-half occurred before the age of thirteen. Observe that this is the proportion met with in hospital practice, which affords very different cases from those seen in private. For example, the operation for stone is excessively rare among children of the middle and upper classes. I don't know any disease which marks more distinctly, or more curiously, its relations with class than this. So common is stone in the children of the poor, comparatively speaking, that at Guy's Hospital, surrounded as it is by a very large neighbourhood, densely populated by some of the worst-nourished classes of the community, quite one-half the cases admitted are children. Among the same classes, however, it is rare at the other end of life; very few elderly working men in London being afflicted with it. On the other hand, among the well-to-do and well-fed, while almost never found in childhood, it is comparatively common at advanced age. This fact has been very much overlooked, and the frequency of calculus at this period is greater than most people believe.[1]

The varieties of renal and vesical calculus are not numerous, and a few details suffice to describe them. I shall regard three chief classes as the most important to consider in relation to the practical management and the removal of stone in the bladder. That which is most frequently met with there is formed of uric acid and its combinations; the second is that in which phosphoric acid is combined with volatile alkali and the alkaline earths; and lastly, there is oxalate of lime. For all practical purposes those are the three great divisions. Among these, uric acid and the urates form about three-fifths in number, a few of these having a slight admixture of phosphates; while nearly two-fifths are phosphates, either alone or in combination with some uric acid, in which latter case the term 'mixed' is applied; lastly, about three per cent. of the entire number are composed of oxalate of lime. It is necessary only to remember further, that very rarely a calculus may be formed of pure phosphate of lime or of cystine. It has fallen to my lot to operate on one case of each in my life.

Next, what is the ordinary history of

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[1] See further observations on this subject. Lecture XIX.

stone? You know well, of course, that the appearance of a stone of some size in the bladder is not the first stage of the malady. The stone begins always—I am now speaking of uric acid—as fine sand or gravel, to use popular terms: that is to say, there is an excess of urates, which, perhaps, steadily persist; then, possibly, of uric acid, in characteristic cayenne-pepper-like masses of crystals; then there are small rounded bodies of this latter aggregated within the kidney, about the size of shot, or somewhat larger, of which you have very good specimens here.

An acid calculus, then, is always formed within the kidney; and occasionally—but happily this is a comparatively rare circumstance—it is retained there and becomes a renal calculus, the occasion of great misery, a condition for which surgical treatment, until lately, has rendered very little service. Of late, however, the operations of nephrotomy and nephrectomy have enabled us to afford complete relief to some who suffer from immovable calculus impacted in the renal region (*see* Lecture XXIII.). Happily, however, a renal calculus generally comes down into the bladder, and is passed—say in ninety-nine cases out of a hundred—without any operation whatever. The patient has an attack of severe pain in the back, over the hip, in the groin and testicle, lasting for some hours, and mostly accompanied by vomiting, which symptoms commonly disappear with the descent of the calculus from the kidney to the bladder. Having arrived there, it is generally expelled by the urethra, either at once or after the lapse of a day or two, and there is an end of the matter for the present at all events. But the patient ought to know, or must be told, that this occurrence shows a strong proclivity in his constitution towards the formation of stone, and he should immediately do all he can to prevent its continuing, as in the nature of things it will do (on this subject see Lecture XV.). But if the bladder is unable to expel the calculus, it soon increases in size by deposit on its surface of acid from the urine, and a very hard but rather brittle stone is formed in the course of time. All the stones which you see in this box have been passed through the urethra by the natural efforts; and it is worth knowing how large a stone may be so passed in some cases. Usually, when they become as arge as some of these, they fail to pass, and then some operation must be performed for their removal.

The phosphatic calculus is not often formed in the kidney; it is so sometimes, but is more commonly produced in the bladder. In the mucus of a diseased bladder much phosphate of lime is formed, and this, meeting with phosphate of magnesia, a constant urinary product, together with ammonia from decomposed urine, a new combination results—viz., the ammoniaco-magnesian or 'triple' phosphate. This, again, with the phosphate of lime, makes 'fusible calculus,' the commonest form met with. The structure of these calculi is not dense, and they are easily crushed.

The oxalate of lime, or mulberry calculus, I need not tell you, is not originally formed in the bladder, but in the kidney, and it is the hardest in structure and the roughest in external surface of all.

Now, what are the symptoms of stone? These we will seek, if you please, by means of the four questions always to be used. A patient tells you, perhaps, that he has passed some gravel for a year or two, and may show you some small stones which he has passed. For the last few months, perhaps he has not seen any—a good sign he thinks, but to him a delusive one; for during that period he has had some pain, perhaps difficulty in passing his water, circumstances which will strongly excite your suspicion.

First, you will commence with an inquiry as to frequency of micturition. The patient has for some time had more or less undue frequency, but it is increased during the day when moving about, and is less observed at night, when he is at rest. This is contrary to what usually takes place in prostatic enlargement, and hence it is a useful diagnostic sign.

You next ask for pain. The patient with calculus of the bladder almost always feels pain at one particular spot, the lower part of the glans penis, about an inch or less from the external meatus. Remember, you may have some pain there when there is no stone in the bladder, as in chronic prostatitis and in some affections of the bladder; but in stone it is almost always present, and is usually severe. Further, with regard to pain, the question should be asked, whether the patient feels it before, during, or after making water. He will tell you that it is during and after; whereas you know, in hypertrophied prostate, and in all cases in which water is retained, the pain is before passing water, from distention of the bladder, and the pain is relieved by the act of emptying it. A man with stone feels pain after making water, because the foreign body is then left in contact with the lining of the bladder, and being carried to its neck, severe pain and a strong desire to micturate are felt, perhaps for four or five minutes after he has ceased to do so, until fresh urine entering, the coats of the bladder are separated from the stone.

Then you ask as to the condition of the urine. In nine cases out of ten you find that there are a little muco-pus, and sometimes streaks of blood. There is almost always, but not invariably, more or less clouded or muco-purulent urine with calculus, if the patient's habits are active.

Then, lastly, you ask the patient if he has seen blood in the urine. Almost without exception blood has been passed at some time, and is seen in the urine by the naked eye: and almost invariably, even when no blood-tint is observed, a few corpuscles will be found by the microscope. But it is generally apparent after exercise, and therefore he can rarely ride on horseback or in a jolting vehicle without communicating a tinge of blood to the urine; nor without considerable pain. On the other hand, the bleeding caused by calculus is rarely considerable, such for example, as is sometimes seen in prostatic disease, and in tumour of the bladder. Finally, all the symptoms of calculus are much intensified by any quick movements of the body. A patient, therefore, presenting himself with the conditions described ought always to be sounded.

Then, how do you sound? You should employ an instrument like this, with a small short curved beak, because it can be turned in any direction. (Fig. 34.) If you use an instrument with a large curve, like a catheter, you are unable to rotate it in the bladder, and hence it cannot explore sufficiently.

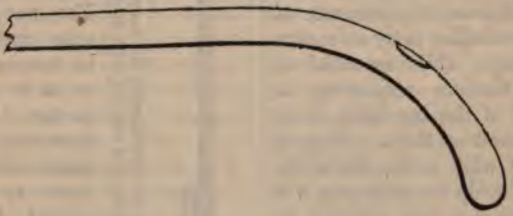

FIG. 34.

When I entered this room, you heard me ask for the hospital sounds, for I knew I should find among them a good example of what a sound ought *not* to be. Here is one, for example, which no one could rotate in the bladder, or even find a small stone behind an enlarged prostate with, except by sheer accident. It has precisely the form of a common catheter, and its only claim to existence now is as an example of antiquated and obsolete instruments in a museum of surgical history. You will say, naturally enough, 'Why are such sounds here, and who has used them?' They were used formerly, and found a good many stones, too, in the hands of our illustrious predecessors. But I will answer for it, they have missed a good many stones also; and those, the small ones, which especially, as we shall see hereafter, are those which it is of the last importance not to miss; and such is precisely the error which I trust you will not make—is precisely what I want you not to do. I have no hesitation whatever in saying that more stones are missed in sounding than are found by the ordinary methods still adopted, I regret to say, in this country; and that must be the case if a sound of the form of the common catheter is relied on for the purpose. But with an instrument which has this small beak at the end of it, you can search in every direction (*see* Fig. 35). If there is a large stone, of course you can usually find it with any instrument; but our great object is to detect the small stones. As a rule, anybody can find a large stone; the delicate and rightly trained hand is necessary to ensure the discovery of a small one. It is most important to find a small stone, because if overlooked it will grow large, and may be very formidable to deal with; whereas, when it is sma its removal is a far less serious matter. You may promise the patient, in the case of a small stone, that it may be removed without risking his life; whereas, in the case of a large stone there is always some risk, often considerable danger. It is impossible to overrate the importance of finding all stones when small,[1] and this you can only ensure with an appropriate sound, rightly applied.

In the next place, how are you to use this instrument?

First of all, it is not to be introduced in the same way as the ordinary catheter. With the ordinary catheter it is the custom in this country to stand at the left side of the patient, and make a gentle sweep thus into the bladder. With the sound you stand at the right side, and use a different manipulation, which I shall show you when introducing the lithotrite, the form of which is similar, upon the living patient, at another lecture, postponing, therefore, my remarks on the subject until then (*vide* Lecture XIII.).

But merely to discover the presence of stone in a patient's bladder is by no means all that is necessary. It is essential to possess other particulars respecting it, because the nature of the operation to be performed will depend on them. First of all, you must know what is the size of the stone, before you decide on what you will do with it. From the note elicited by merely striking it, and by the sensation communicated to the hand, you can obtain some indication of its size; certainly whether it be large or small, a distinction not always sufficiently precise for our purpose.

There is a more exact, and at the same time a simple, method of determining size, sufficient for most cases, which I have long employed myself and more recently have introduced to the profession. It is far less irritating to the bladder than is the action of any measuring sound with two blades which I formerly used, or of the lithotrite, which is the same thing on a larger scale. It consists in the mere addition to any ordinary sound of a little ring or collar which slides along the shaft, and which by proper manipulation, enables me to ascertain very nearly the size of a stone, as you have frequently seen in the wards. (Fig. 35.) The manner of using it is this. Introduce the sound, feeling the stone as the end passes over it by a succession of delicate taps, until you have placed the end of the instrument distinctly beyond the farther or distant extremity of the calculus as it lies in the bladder. This done, slide the 'collar' down the shaft to the end of the penis, so that it touches the external meatus. Now draw the end of the sound outwards over the stone, delicately tapping as before, until you have reached its near extremity, which is most likely close to the neck of the bladder. The distance of the 'collar' from the end of the penis is the diameter of the stone in the direction passed over. There is nothing painful or irritating in this procedure if conducted, as it always ought to be, with a light and delicate hand.

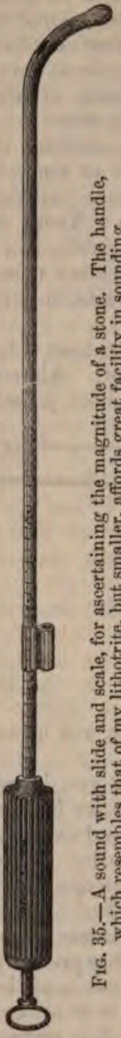

FIG. 35.—A sound with slide and scale, for ascertaining the magnitude of a stone. The handle, which resembles that of my lithotrite, but smaller, affords great facility in sounding.

Then there is the other way, already mentioned. You may introduce a lithotrite and seize the stone in two or three directions, so as to ascertain its diameters. This proceeding, however, sometimes occasions considerable disturbance to the patient, and should be accomplished with as little manipulation as is possible.

At the same time it is desirable to ascertain the nature of the calculus. A phosphatic stone gives a very different note when struck with a sound from that given by the others. The specimen before me is dry, and, therefore, will not give the note to which I refer. When wet, it is spongy and soft, with a rough surface, and always gives a dull note when struck; whereas the uric-acid stone gives a note which is clear and sonorous. Then you will judge partly by the condition of the urine. If the urine is acid, and if, also, uric acid is thrown down, you may conclude that the patient has a uric-acid stone. If so, you may find on inquiry that he has passed small calculi before; and seeing what these are, you may pretty safely infer that all belong to the same variety. In such a case also it is probable that the patient empties his bladder perfectly by his own efforts.

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[1] *See also Lecture XIX.*

On the other hand, if the urine is alkaline, and deposits phosphatic matter; also, if the patient is unable to empty his bladder by his own efforts, and requires a catheter, you may conclude that it is a phosphatic stone, or, at all events, that it is covered with phosphates.

I have spoken of uric-acid and of phosphatic calculi. But we may have to deal with an oxalate-of-lime stone—a fact which it is very important to ascertain. You will examine the urine, and observe if it contains much oxalate of lime deposit. The patient may have passed a small mass of oxalate of lime before, and it may be thence inferred that an oxalate-of-lime calculus exists now; but it may have an external coating of phosphates, and thus its real nature may be hidden. The following is a case in point. I had some time ago to operate on a large stone in the bladder of a private patient. I crushed the stone four times, bringing away a good deal of phosphatic material. I soon noticed that my lithotrite never went through the stone: it always went a certain way, and then there was a hard mass. After four sittings I could not crush any more. It was clear that there was a very hard centre stone, on which my strongest lithotrite made no impression, the crust only having been removed. I know, from experience, the recoil of the lithotrite from an oxalate-of-lime stone so well, that I had no hesitation in saying such an one was present. Accordingly I performed lithotomy, and removed a large and well-marked specimen of that kind. In such a case, there would not be oxalate of lime in the urine, but a large deposit of phosphates. It is worth remarking here, that in dealing with the hardest uric-acid stone in a lithotrite, an impression will be made by a turn of the screw, the jaws of the lithotrite will make some impression on the stone even if they do not crush it; but an oxalate-of-lime stone communicates a sensation when grasped by the instrument as if you were laying hold of a piece of iron—you make little or no impression upon it until considerable force be applied.

The number of calculi present is the next thing to be ascertained. Usually there is only one, but occasionally there are more. There is a patient here on whom I shall perform lithotrity to-morrow, who has two rather large uric-acid stones in the bladder. You may determine that point thus: Having seized one in the lithotrite, move it gently in every direction as a sound for others. If then you encounter one on one side and one on the other, you know that there must be at least three stones. There is a source of deception here which it is necessary to guard you against. While retaining the stone between the blades of the lithotrite, and moving the instrument from side to side in search for another, a rattling sound is easily produced which resembles very closely that of contact with another stone. This arises because the stone seized is not closely fixed between the blades of the lithotrite, and it rattles between them. I have seen the error committed of inferring a second stone from this cause.

Sometimes a great number of small calculi are present, varying between the size of a small nut and that of a pea, so that the rattle of several is heard, and, I may add, felt. These are favourable cases for operation, when compared with those in which a single calculus is present, taking equal weights. The large stone on being crushed results in large hard and sharp fragments. The small stones may be regarded as fragments already made, and also possessing a much less irritating form. Of course much less mechanical work is necessary to crush and remove the calculous matter in the last-named condition. In the patient's interest I would rather remove six drachms of such small calculi, than four drachms in the form of a single stone.

Having obtained all these data, the important question is, What operation is to be performed? Are you to perform Lithotomy or Lithotrity?

You know there are only two modes of removing the stone. You must make an opening sufficiently large to admit of its withdrawal at once, or you must crush the stone into small fragments, so that they may be removed by the natural passage. It was far less important to make a diagnosis of all the points named, when there was but one operation—namely, that of cutting. Formerly, whether the stone was large or small, the patient was always cut. There was no other way of removing it. Now that we have two operations, it is very necessary that we should choose the right one; because—and let me impress on you the importance of the fact—if you do not determine pretty accurately the characters of the stone, and select the right operation, you may do more harm than if you cut every patient who comes to you. Thus, if you crush the very large stone, and cut for the very small one, you may have greater mortality than if you simply resorted to the one operation of cutting in all cases. When lithotrity was first introduced, it was unquestionably a rather clumsy operation; and when the cases were not judiciously selected, when surgeons operated without making a diagnosis relating to the points I have enumerated—crushing stones that ought really to have been cut, and cutting for stones which might have been crushed—the entire mortality resulting from operations for stone was greater than it had been previously, when every case was cut. I cannot give you a stronger argument for the necessity of choosing in each case the operation judiciously.

Now, without taking up your time too much, I will lay down what you will understand to be the axioms which should direct you, in a general way, in making your choice between the two operations.

First of all, I will say that all patients with stone, under puberty, with very few exceptions, are to be cut. Under fourteen or fifteen years of age, stones occurring in the male are to be removed by cutting unless they are very small, and can be easily crushed—say, in one operation; because lithotrity is not a very easy or successful operation in children, the urethra being small and the bladder very irritable; whereas, as is well known, lithotomy is a very successful operation in their cases. We scarcely want a better operation, comparatively speaking, and may be content to let well alone. Not more than one death in fifteen or sixteen cases occurs from lithotomy in children. I do not think, therefore, we can do better than cut in these cases, as a rule. If, however, you have in a child of, say, three or four years old or upwards, a stone no bigger than an orange-pip, you may very probably succeed in crushing it, under ether, at a single sitting; and this it is usually advisable to do, employing, of course, a lithotrite of suitable—that is, of small—size.

That leaves us all the cases above puberty; and here lithotomy is only exceptionally available. To facilitate our consideration of the subject I will state, thus, in general terms that the cases of stone occurring in patients who have passed the age of puberty are to be operated on by lithotrity, with now only few exceptions.

These exceptions arise firstly, in relation to some character of the stone itself; and secondly, from some condition of the bladder or adjacent organs.

Exceptions may consist of stones too hard or too large to be crushed. Well, at the present day, whatever may have been said some years ago, it is very certain there are not many specimens which cannot be crushed. Thanks to the experience derived from performing lithotrity by the single-sitting method, we have attained a confidence in applying it to calculi much larger than we ventured to attack before. I used to perform lithotomy for a hard uric-acid calculus, above an ounce in weight, so far as I was able to judge; and for an oxalate-of-lime calculus when somewhat smaller. Phosphatic calculi might be crushed of much greater size. But since I have adopted the operation referred to, I have crushed with complete success a hard uric-acid stone weighing no less than 2¾ ounces; a proceeding which occupied 70 minutes. It is very difficult to say where we are to stop; where we are to draw the line, and say, with this weight we will do lithotrity; and with this weight, lithotomy must be performed. In fact, such complete rules cannot be laid down. Much must depend on the patient's condition: still more, as we shall see hereafter, on the qualifications of the surgeon. At all events, the great majority of calculi, omitting only the very large ones, must be regarded as removable by lithotrity, and with every prospect of success, in the hands of an experienced operator.

Now, what are the conditions on the part of the *organs* which will make it necessary for you to cut instead of crush? They are very few indeed. Formerly, almost any kind or degree of disease in the urinary organs was held to contraindicate lithotrity. I think it has fallen to my lot chiefly to demonstrate that this was an error.

First of all, I will name certain diseased conditions which are not exceptions to the rule, and which you need not necessarily regard as disqualifying the patient for lithotrity, although held to do so by some authors, and perhaps I may say, by many of the profession still.

In presence of stricture of the urethra it is commonly said that lithotrity is of course impossible. Also, that in marked hypertrophy of the prostate it is difficult and undesirable. That if the bladder is very irritable—that is, if the calls to pass water are exceedingly frequent and painful—lithotrity is a most unpromising operation. That in any severe disease of the bladder, it is out of the question; and finally, that in disease of the kidneys, it is more dangerous than lithotomy.

I reply first, in relation to stricture of the urethra, that our ability to crush a stone is thereby limited, but that small stones may be safely dealt with. I have recently crushed a uric-acid stone in a case of organic stricture with small instruments made for the purpose; but the stricture was not a very narrow one. And more recently I have crushed stone in two cases in the wards, where confirmed stricture has existed, by the following method:—I retained a catheter for a few days, and dilated the stricture thus to No. 10; then placed the patient under chloroform and introduced a lithotrite of moderate size, removing as much débris as possible. I then re-introduced the catheter, and let it remain there for three or four days, until the patient was ready for another sitting, and so on until all was removed. This plan answered well for two men who were not in condition for so formidable an operation as lithotomy, and whose calculi were not large.

Secondly, in marked hypertrophy of the prostate, I make no difference whatever, and would almost as soon crush in the presence of this condition as in a younger patient without it. If the hypertrophied prostate occurs in a man who has had instruments passed, he will have become habituated to them, and is sometimes, therefore, a better subject than a healthy one who has not been so accustomed. If he requires very frequent catheterism, his case is one of somewhat increased hazard; still, if the bladder becomes much inflamed subsequently, and catheterism not only becomes more frequent but difficult, the condition is very serious. In these circumstances, when the bladder is wholly unable to relieve itself by natural efforts, I have adopted two methods successfully: one is to remove the stone by lithotrity, and to introduce a tube into the bladder by a very small opening above the pubes, in the manner described in Lecture XX. The other, which I have employed with excellent result, is to make a small perineal opening into the prostatic urethra, and tie an English gum catheter in the bladder through the perineal wound, which gives the patient little or no inconvenience, and saves all the frequent and painful catheterism which had previously been necessary, lithotrity being first performed of course as in the preceding instance.

Thirdly, in relation to the bladder which is merely atonied, and unable to void its contents by its own power, all the urine being drawn off by means of a catheter; lithotrity is often preferable in this case also, and for the reason just assigned—that is, the bladder and the urethra are habituated to instruments.

Fourthly, irritability or extreme sensibility of the bladder is not an insuperable objection. It used to be said that if the bladder could not hold above three, or four, or five ounces of urine, there would be no room for the lithotrite to work satisfactorily, and therefore the surgeon must perform lithotomy. I make no objection even to considerable irritability of the bladder, because this is due to the presence of stone; and as soon as you have removed the stone, the irritation diminishes or almost disappears. Besides, it is not necessary for the operation to have four ounces of water in the bladder; one ounce is ample. The presence of four or five ounces was thought to be necessary with the large and clumsy lithotrites of former days, but with modern instruments the bladder even when empty is scarcely in any danger. When instruments were used that were apt to lay hold of the coats of the bladder, a quantity of water in its cavity was a desirable protection; but a well-made lithotrite will not injure the bladder, and with such an instrument there is no difficulty whatever in crushing with a single ounce of water. I am indifferent when operating, whether the bladder is quite empty, or contains two or three ounces of water; and I only dislike to have the organ distended by six inches or more—nothing is more embarrassing than a large quantity of fluid; currents are produced by the lithotrite, which catch the stone, or the fragments, roll the about anywhere rather than between the grasp of the instrument, and seizing them is rather a game of chance than of skill.

Fifthly, as to advanced disease of the bladder, each case must be dealt with according to its particular merits. In cases of notable tumour of the bladder, complicated with calculus, which are very rare, the propriety of any operation must be doubtful. I once in this hospital greatly mitigated, for the few weeks he had to live, the sufferings of a poor fellow with cancer in the bladder, by crushing a phosphatic calculus. No one certainly could ever have dreamed of submitting him to a formidable cutting operation.

Sixthly, as to the comparative applicability of the two operations in the presence of the various forms of renal disease—a very large subject—I must defer the consideration of it to a separate lecture (*see* Lecture XXII.). Suffice it to say here, that modern lithotrity will in most cases be safer than lithotomy. Some years ago the contrary decision would no doubt have been more judicious.

You see, then, that the exceptions are rare, and limited almost entirely to those cases which are difficult or hazardous, because the stone is unusually hard or large. Indeed, there are not many adult cases which cannot be advantageously treated by lithotrity, provided proper care and attention are afforded. If surgeons of the present generation now growing progress, as they must, and become more intelligent and more careful than those who have gone before—if they are better acquainted with the subject than their predecessors were, as in the nature of things they must be, as our sons will be wiser than ourselves and our grandsons wiser than they, there will be fewer and fewer exceptions. For it is certainly true that if the stone is discovered before it is large, *it can always be crushed with an almost certain chance of success*; lithotomy, therefore, for adults must at some day disappear, except for those cases in which the symptoms have been greatly neglected by the patients themselves, or the presence of stone has been overlooked by the medical attendant.

A rather large uric-acid stone is the growth of several years; a large phosphatic stone is perhaps the growth of two or three years; an oxalate-of-lime of full size, say from seven to ten years; and it is very hard if, long before the expiration of such periods, the stone cannot be found and disposed of by lithotrity. It is certain, if a calculous patient has the benefit of intelligent oversight and treatment, that his stone will be always discovered, when it can be crushed with almost a certainty of success; so that the only cases in which lithotomy will have to be performed are those in which the patient has neglected himself, and although suffering severely for years, has not sought professional aid. But such cases must be few indeed. I believe that in future lithotomy for adults will be a rare operation in surgery. I cannot say that I regard this result with unmixed pleasure; for lithotomy is a grand operation, demanding skill, self-command, and sometimes all the resources of an experienced and able man. The successful performance of the operation is one of the highest practical achievements of a good surgeon, and so considered, one shrinks from desiring its complete extinction; but it will gradually disappear, or nearly so, and speedily; and as we believe such a consummation to be beneficial to humanity, we must acquiesce in the result.

LECTURE XII.

ON LITHOTRITY, ITS HISTORY, AND ON THE INSTRUMENTS EMPLOYED IN THE OPERATION.

I THINK that the best way of commencing our study of lithotrity is to give you a brief sketch of the history of the operation, and of the steps by which the original and primitive instruments attained, through progressive improvements, the high degree of power and capability which the modern lithotrites and aspirators possess.

Lithotrity, as an operation, owes its existence to the French surgeons, mainly to Civiale; but the labours of Leroy d'Etiolles, Amussat, and others were not without value in developing a system. My old friend Civiale, who died in 1867, at a good old age, and full of honours, was the first surgeon to crush a stone successfully; and this he did in the year 1824, with instruments which he had designed in 1817. No doubt something resembling the process had occasionally been accomplished by patients themselves. In one instance a man had managed to grind down with a small file a little stone in the bladder, a circumstance which has been dignified with the title of an operation of lithotrity. But the first man who designed and performed a systematic operation on the living patient was Civiale, and he operated on his first two patients before a committee of the Academy of Medicine, with this instrument that I hold in my hand. You see how different it is from anything we now employ. It is a straight instrument, with a central axis and three claws, which were made to project after its introduction into the bladder. [The manner of using it is shown.] You see what a very different mode of proceeding that is from the method now adopted. It consisted in drilling holes in the calculus in various directions until it gave way, and each fragment was subjected to a similar process, until the whole was converted into débris. Notwithstanding the tedious character and the difficulty of the procedure, it was, to a certain extent, a successful operation. I cannot now describe to you all the varied proposals made about and soon after this time, but the most important change was the production of an instrument in which pressure between two blades placed at nearly a right angle with the shaft, constituted the agency by which force is applied. This was a great improvement, to which the profession is indebted to a late Mr. Weiss, of London, at so early a period as the date of Civiale's first operation (1824). This system of crushing soon replaced the perforator, and although Weiss's instrument has since been modified in several particulars, his system is still the favourite one with all operators. While the method of Civiale was originally perforation and grinding, lithotrity became after Weiss's instrument what it still is, a process of crushing.

Let me here ask you to observe that a lithotrite always consists of two chief parts: viz., the prehensile part, which deals with the calculus; and the power-regulating part, or that which receives and distributes the force applied by the hand. It was the first-named part above referred to, which had at this early period so nearly approached perfection. The next improvements were those which related to the opposite end of the instrument which transmits the force to the crushing blades. Various ways of aiding and modifying this were tried: in one, the patient being fastened to a special bed, the lithotrite, which was extremely large and clumsy, was fixed in a vice, and the force was communicated by the blows of a hammer. [Baron Heurteloup, 1832.] The screw was used also in some form at or before this period—it is said first at the suggestion of Mr. Hodgson, of Birmingham. Costello subsequently made mechanical modifications in the details of the screw lithotrite, which still continued to be an unwieldy and dangerous instrument. Mr. L'Estrange, of Dublin, also made a useful alteration in it. The apparatus thus gradually improved, and used here long after this time (1840-55), is the next which I show you. It has become somewhat smaller, and therefore less likely to injure the urethra than its predecessors, but the power is applied only by means of a thumb-screw, which works very slowly. Nevertheless, it is the instrument with which Sir B. Brodie earned his success, and it is handled thus. [Explanation.] You see how much time is wasted, not only in the action of screwing home to crush a fragment, but in unscrewing in order to prepare the blades to seize another. No amount of crushing worth the performance could be executed in less than a quarter of an hour, and sittings of a much longer duration than this were quite common in using this instrument in order to reduce a small stone. Another change, useful in its day, was that in which the power was regulated by means of the rack and pinion; this was due to Sir William Fergusson, who used it almost to the end of his career, and by its means he shortened the process considerably.

The next improvement was a very great one, and is due to Civiale and to the late M. Charrière, of Paris. An ingenious mechanism in the handle, moved by a disc there, enables the operator to exchange the screw-movement for a sliding one at will, and *vice versâ*. This saved all the time lost by the slow process of unscrewing, necessary to open the blades of the previous instruments every time they have been closed. (Fig. 36.)

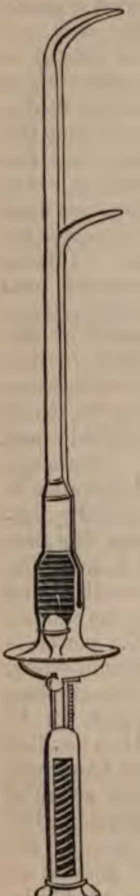

Fig. 36.—Lithotrite of Civiale and Charrière.

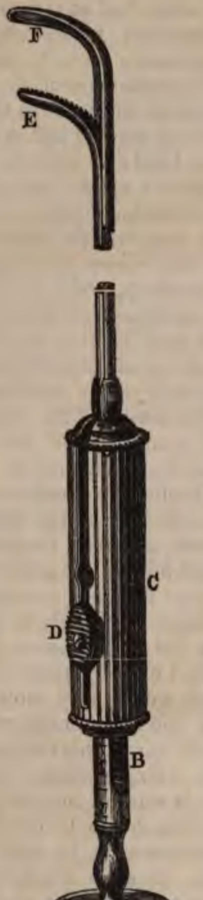

Fig. 37.—Lithotrite with cylindrical handle.

A, wheel-shaped end of sliding shaft, held in the operator's right hand, which directs the movements of the male blade E.

B, The screw.

D, The button which throws the screw into gear or releases it, as desired.

C, The cylindrical handle attached by outer shaft to the female blade F.

We now come to the lithotrite before *you, the cylindrical handle of which is my own suggestion and design* (Fig. 37); while the new mode of changing screwing into sliding action is due to Messrs. Weiss, and is much more convenient than the action of the disc in the instrument just described. And this combination has been adopted almost universally throughout Europe; and of course, as would naturally happen, various 'modifications' of it have been made by instrument makers and others, with the result only, as far as I have seen, of impairing its power in some way, such changes having evidently been devised through ignorance of the proper mode of using the original instrument. The principle of the cylindrical handle which I introduced, and for the importance of which I contend, is, however, retained in all the varieties—among others, in the lithotrites which Professor Bigelow has lately devised—and this circumstance is the best tribute which could be paid to its value.

In what respect does it differ from previously constructed handles? It enables you in the search for a small stone or small fragments, to execute rapid and delicate movements, which would be impossible with an instrument without the cylindrical handle. It also enables us to operate in less time and with less disturbance to the bladder than any other instrument. Anything that will diminish the duration of the operation, and the amount of movement and concussion to the organs concerned, will necessarily give a greater prospect of success.

I next call your attention to the blades of the instrument by which the calculus is to be seized and crushed; and you will observe that of these there are two specific varieties, termed fenestrated and non-fenestrated. Usually, when the stone is large and hard, it is necessary to begin with the fenestrated instrument—one in which the female blade is entirely perforated, allowing the male blade to pass through it. This mode of construction furnishes the most powerful lithotrites, with which the most work can be done, while no blocking of the blades can occur, because all débris is driven through the opening, or falls away right and left on the outside. The edges should be well bevelled, and the general contour should be such as to avoid all possible contact between its toothed or cutting parts and the walls of the bladder.

Forms may be seen below of two

varieties, one more, one rather less completely fenestrated. (Figs. 38, 39.)

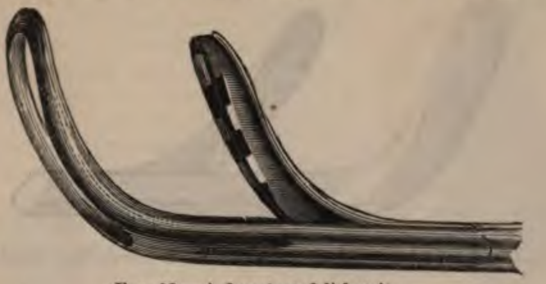

FIG. 38.—A fenestrated lithotrite.

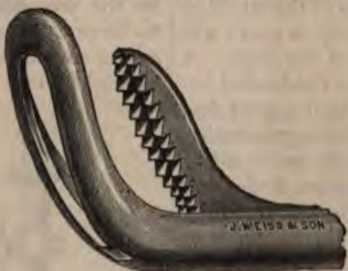

FIG. 39.—Another form of fenestrated lithotrite.

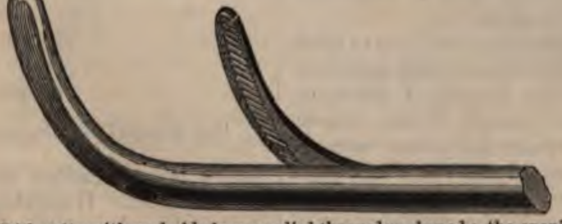

FIG. 40.—Lithotrite with male blade very slightly wedge-shaped: the opening in the female blade should be rather larger than represented here.

After a large calculus has been broken into numerous small fragments by these instruments, the crushing into débris sufficiently small to pass through a large evacuating catheter, is best accomplished by means of non-fenestrated, or flat-bladed lithotrites. Such instruments—or a modification in which a small opening exists in the female blade, which is preferable—are adapted also to the majority of cases, in which the stone is of small size, or, indeed, of any size up to that, say, of a filbert, or an almond in its shell. They are more convenient and manageable than large and heavy instruments, and their blades are so flat that little space in the bladder is required to include a stone between them, beyond that which the stone itself requires. When closed, the edges of the blades, which are well bevelled, do not meet, and the male blade is always narrower than the female, so that a groove exists all round between them, by which included débris, when too much is present, can be expelled. Pressure of the stone between such blades has a tendency to produce small débris rather than large fragments. But there are two chief varieties of these instruments, adapted for two different results required. (1) The male blade may be made narrower than usual, and more or less wedge-shaped, and then the function of the instrument is that of dealing with the rather larger and harder stones, and to make large fragments. (Fig. 40)[1] Such an one should be also a little fenestrated, and it should, of course, be rather stouter than the ordinary model. (2) The male blade may be made almost as wide as the female, and then the function of the instrument is to make fine débris; and its use is to complete the work commenced by the first. (Fig. 41.) The wider the blades are, the more liable they are, of course, to become impacted with débris in the bladder. At the angle of the female blade there should always be some opening as large as can be made without materially weakening the instrument there, in order to permit impacted débris to escape, as at this point it is most effective for mischief; while, as I show you, rapid backward and forward rotary movements of the wheel at the handle (the screw being *in* gear) will expel much of the débris at the sides. A collateral advantage of this flat-bladed instrument is that it will hold a good deal of fine débris without undue augmentation of its size, so that not a little can be safely brought away by the urethra if desired, whenever the instrument is withdrawn.

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[1] Only slight approximation to the form of the wedge in the opposing surface of the male b
permissible. If it has an angle, say of 90

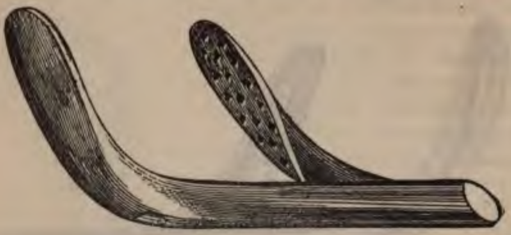

FIG. 41.—Lithotrite with flat blades; the opening in female blade should be larger.

Such instruments should be made of steel of the finest temper, cut from the solid block (not forged), so as to be completely trustworthy. The power and leverage of the screw in the handle should correspond with the strength of the blades, and therefore with the amount of work they have to do. One lithotrite of each kind, the narrower and the wider male blade, suffice for all cases of moderate-sized stone in the adult.

The next instruments we have to speak of are evacuating catheters and aspirators. Very early in the history of lithotrity, it was apparent enough to the surgeon that he might render his patient essential service if he could remove the débris, as well as crush the stone. Some of it of course might pass by the expulsive action of the passages, which is considerable; but a fragment was often impacted in the urethra, or several were irritating the neck of the bladder, and occasioning great trouble both to the patient and his attendants, to say nothing of the risks to life, by no means infrequent, occasioned by the presence of these foreign bodies. So large catheters were introduced, and a strong current of water was injected from an eight-ounce syringe, but often with results less efficacious than one might have expected. Heurteloup, particularly, employed means of this kind—1840–50. It was always a disappointing process: hence some other mode of suction was sought, and brought to bear on the contents of the bladder. Thus Sir Philip Crampton of Dublin used a glass receiver exhausted of its air, and attached it to a large catheter, with a result which was to

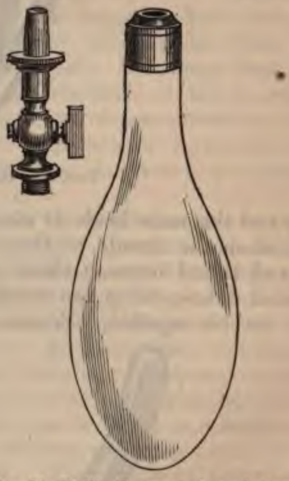

FIG. 42.—Sir Philip Crampton's aspirator.

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some danger is incurred; it may be driven through almost any stone, it is true, but the fragments will fly off right and left with prodigious force, even in fluid, and injure the coats of the bladder. Also, when the male blade has the form of a rather sharp *wedge, the calculus is seized and retained with greater difficulty than with a male blade which is less salient.*

a certain extent successful (1846). This was the first aspirator (Fig. 42).

Soon afterwards Mr. Clover designed an india-rubber aspirator with a glass cylinder, trapped to prevent reflux of fragments, which answered its purpose exceedingly well. The evacuating catheters were silver, Nos. 12 and 13 in size (Fig. 43). This apparatus was much used by myself at an early period to supplement the action of the bladder, and has been largely used by me ever since.

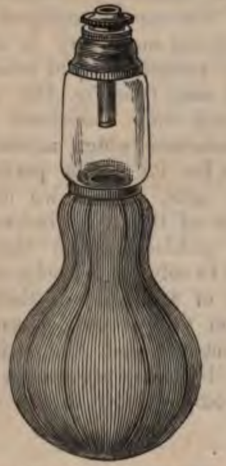
FIG. 43.—Clover's aspirator.

In 1878 an important change was proposed, as is well known, by Professor Bigelow, of Harvard, U.S. He advised that the stone, however large, and without respect to the presence of cystitis or other considerations, should be invariably removed at one sitting, by means of more powerful lithotrites, larger evacuating catheters, and a stronger india-rubber bottle than had before been used; no matter how long the time which might be necessary to accomplish the task. He believed that less damage would be inflicted upon the bladder and related organs by a long single sitting, provided the viscus was completely emptied of débris thereby, than by the old process of taking away a little and often, but leaving fragments in the cavity, often causing continued and serious irritation. In order to carry out his idea he designed an aspirator with a long tube attached to the upper end of it, a method which in practice does not answer well, from the constant presence of air at this part. For the purpose of the new procedure I constructed one specially adapted to it, light and small, so as to be easily grasped and governed by one hand, but with an opening *at the top*, by which it can be filled with water, to which all air accidentally admitted, if any, will arise, and by which it can escape. The lower part is connected with the evacuating catheter by the shortest route to the bladder, and in such a manner that the aspirator can be detached with ease, and

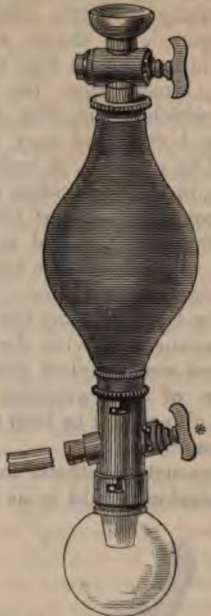
FIG. 44.—Original aspirator of the author.

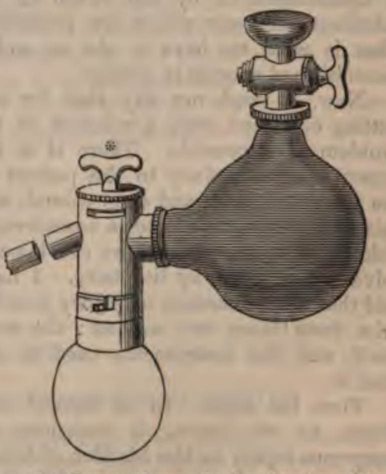
FIG. 45.—Recent change in the situation of the trap.

without loss of any contained water in so doing. Lastly, there is a trap into which all fragments must fall, and by which they are securely retained (*see* Fig. 44). Quite recently a little alteration has been suggested, as shown at Fig. 45, which is identical with Fig. 44 in every particular, except that the cylindrical receiver, which is in Fig. 43 directly under the bottle, and may be slightly influenced by currents, is removed to the front of it, in which situation the receiver and its contents are less influenced by the backward and forward currents produced by the hand of the operator, than in the original instrument. In neither Fig. 44 nor Fig. 45 is any stand required, and the connection with the bladder is the shortest and simplest possible. The connection of the aspirator with the bladder is also cut off in both instruments by the taps (*).

The evacuating catheter to be attached to the aspirator should be as large as the urethra will admit; usually Nos. 15 or 16 of the English scale may be used without any danger. Sometimes Nos. 17 or 18 are admissible; but such sizes are quite unnecessary for small stones, and may produce mischief: hence they are only to be used where the presence of a large stone demands corresponding instruments. The curves employed differ, and the apertures may vary in situation; a choice of varieties should be available for different cases (see Fig. 46).

Having thus described briefly the armamentarium which modern lithotrity demands for its proper performance, we may ask next, so that we may obtain a clear idea of the object before us: What is the problem which this operation proposes to solve? I reply, that it is the removal of a calculus without inflicting injury on the urinary passages; and if we reflect we shall find that injury is possible by this proceeding from two sources only—either in the employment of instruments, or by the action of the calculous fragments which are produced. That is what we have to aim at, and if accomplished success is certain.

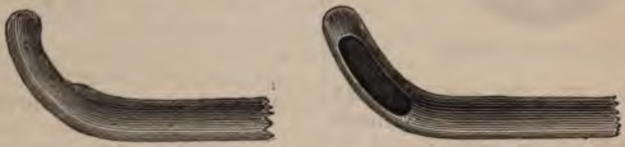

FIG. 46.—Evacuating catheters.

Now, I need not say that by any cutting operation such a solution of the problem is impossible. There is at the outset a severe injury to the patient in the shape of a large and deep wound, and this necessarily constitutes a considerable risk. Let us see how far we can hope to solve the problem by lithotrity. I have said that all the chances of injury possible arise from these two sources: the stone itself, and the instruments used to extract it.

First, the stone. In its natural condition, as we know, it occasions no dangerous injury to the bladder, although it causes much pain, and ultimately chronic disease of the organs which are concerned with it. But when the stone is broken up into large angular fragments with sharp edges, these become a source of injury, and severe cystitis is readily *induced* by their presence. Hence it has always been an established principle directing all our proceedings, that the process of crushing the stone shall be conducted (so far as it is possible to do so) in such a way as not to produce and leave within the bladder numerous sharp fragments. And if the calculus requires more than a single sitting to remove it, this system must be pursued. Now, however, that we adopt the method of emptying the bladder at one sitting, this danger from the broken stone no longer exists. In fact, it is the avoidance of the evils produced by broken stone when remaining in the bladder which constitutes the superiority of the one-sitting operation.

Secondly, the instrument used, and the method of manipulating it, may be productive of much injury, both to the bladder and to the urethra. It has, therefore, been an object with me, first, to render the action of the lithotrite itself as easy and speedy as possible; and, secondly, to lessen, as far as I could, the number of instruments employed, the amount of manipulation applied to them, and the time devoted to the process. I have shown you how, in conformity with this principle, I have endeavoured to design an instrument which should produce the least possible irritation. And I will only add, that if we can get an instrument which will do its work with less disturbance still, it will be, *pro tanto*, a valuable step in advance.

Now, as to diminishing the number of instruments used. Formerly it was laid down as an axiom that you should never use a lithotrite in a patient's bladder unless it contained a known quantity of urine or other fluid. Hence the urine was always withdrawn before introducing the lithotrite, and four or five ounces of water were injected. I have shown that these preliminary injections are wholly unnecessary, and I never use them—never even asking a patient to hold his water beforehand, nor when he micturated last. It is said, 'If there is only a small quantity of water, how can you be sure that you will not injure the coats of the bladder in endeavouring to seize the stone?' There is no difficulty in that respect, because these instruments are so constructed that you can scarcely lay hold of the bladder with them, as we shall see, if you try to do so. When instruments were used in which the edges of the blades closed upon each other accurately it was different. But these edges never do so, they are well bevelled, and do not quite meet; hence the safety of the instrument.

Then there is another species of mechanical irritation which may be met with. It was common—and it is so still, I believe, with some surgeons—to withdraw large fragments of stone from the bladder through the urethra. The surgeon would lay hold of them with the forceps, or with some other contrivance, and would really seem to think he had achieved a feat of dexterity if he drew from the bladder a calculus as large as a bean. Now, in order to draw out such a calculus, it must first be seized. Well, if you have once seized it, why not give it one turn of the screw and reduce it to powder? Why subject the neck of the bladder and the urethra to pain and injury by forcibly dragging through the latter a sharp angular fragment of stone. Never, on any pretence, withdraw a lithotrite with such a fragment, or overloaded with débris, if you can possibly avoid the necessity for doing so. Our object is to crush the stone into débris capable of being extracted safely through the evacuating catheter.

Such are the instruments required for the modern operation of lithotrity. Accessory ones are, large conical metal bougies to ascertain the size of the urethra, in relation to the evacuating catheters which may be required, or to facilitate their introduction. Also a scalpel or short urethrotome, to divide the external meatus, should be at hand, which may be necessary when the latter is narrow. Urethral lithoclasts and other contrivances, to remove fragments impacted in the urethra, will not be wanted if we remove the débris artificially, as now ought almost in every case to be accomplished.

I shall illustrate the actual performance of the operation at our next meeting.

LECTURE XIII.

DIRECTIONS FOR PERFORMING THE OPERATION OF LITHOTRITY.

We saw at the last lecture that the history of Lithotrity was to a great extent identified with a history of perfecting the instruments employed. It commenced with drilling and grinding a small calculus by a slow and difficult process, a little fine débris only being made at each time, or sitting, which débris the patient voided subsequently when passing water. It was not until this process had been greatly improved that anæsthesia was discovered; and after its introduction, Civiale, whose experience was the most considerable of any living surgeon, still preferred to crush without the aid of ether. By degrees, however, anæsthesia was generally adopted on this side the Channel, and one consequence was that we gradually ventured to crush more than formerly at each sitting, and more largely adopted the aspirator. We adhered more or less to the master's cautious style, and, unless the calculus was small, followed him in employing three, four, or more sittings before emptying the bladder. For myself, as is well known, I have used chloroform (now ether), almost without exception, for the last twelve years or more; and further, whenever severe cystitis has appeared after the first or second sitting, I have operated at once, removing the whole of the calculus if possible, as the best means of treating the inflammation. But, during the last three or four years, I have carried out fully the principle proposed by Bigelow, of removing all the débris at one sitting, however large the stone, and have attained a remarkable success, as I shall have to show you at another time. Professor Bigelow gave to his procedure, already referred to, a new name, and not perhaps a very euphonious one, viz., Litholapaxy. I do not object to it on this ground, however, but I do for a more serious reason—namely, because the term was designed on the assumption that artificial 'evacuation of the stone' (λίθος, a stone, and λάπαξις, evacuation) was a new proceeding. Now, this is not at all the case; we have both crushed and 'evacuated' the stone for many years, and we had called the combined processes 'lithotrity,' a term thoroughly well and everywhere understood. But we had, as a rule, not completed the operation *at one sitting.* That is Bigelow's idea, and an excellent one it is. Hence I proposed, and always employ, the term 'Lithotrity at one sitting,' or 'at a single sitting,' to distinguish his operation, as conveying accurately the essential change which he proposed; and I think it is now pretty generally accepted.

It is this method which alone I have now to bring before you. Instead of taking away, little by little, a portion of the stone, at five or six successive sittings of not more than three to six minutes each, performed every third or fourth day, until the whole was removed, the operation is completed at the first sitting. Formerly, we used the most delicate lithotrites, handling them often in the lightest manner, with an eye on the patient's countenance, whose consciousness enabled us to know *how far we might* tax his endurance. Now, we employ heavier instruments, and while care is as necessary as ever, and experience and tact in the management of them more than ever valuable in dealing with unusually hard and large examples, the amount of work to be done, especially in such cases, demands a vigorous hand and wrist, strong, well-made apparatus, and as large as the urethra will fairly admit.

Supposing we have decided to perform the one-sitting operation for any given patient, with a stone of average size; if he has never had any instrument in his bladder before, and the urethra is not very capacious, a young surgeon may do well to pass a bougie once or twice before operating, to make certain of a good route into the bladder. Such a proceeding, however, is rarely necessary. Then you should not be indifferent to the state of the patient's general health. You ought not to operate when there is an attack of fever, nor unless the digestion is in fair order, and the bowels are acting tolerably well. Take care that you have the local organs, and the whole system, in as favourable a state as possible at the outset. If his habits have been of necessity too active, as in the case of the labouring man who has been compelled to work almost up to the time of his admission to the hospital, a few days' quiet in bed, or nearly so, are useful before commencing operations.

THE OPERATION. The patient can be in no better situation than lying in his bed warmly covered, with long woollen stockings to protect the lower extremities from chill in case of long exposure; the mattress beneath should be firm. If a long operation is anticipated on account of the size of the stone, the warmth of the bed and the coverings referred to are important. The operating table ordinarily employed is too high for the surgeon's convenience, and the air of an operating theatre is often less desirable than the warmth of the ward or bedroom, together with that of the bed itself—for a rather large stone may demand twenty or thirty minutes. The longest term I have occupied has been seventy minutes; it was for a hard uric-acid calculus, of which the débris weighed 2¾ ounces; the whole was completely removed in that time, and no untoward symptoms followed. But let me tell you that was one of the hardest labours of a manual kind which ever fell to my lot: the amount of force which must be expended on such a stone is very considerable indeed;

and an exposure to cold air or draughts during such periods of time, might of itself imperil some patients' lives: hence the importance of these suggestions at the outset.

The next point to be observed is the position of the patient. He should lie close to the edge of the bed, so that his right side is easily accessible to the operator; a small pillow should support the head, not the shoulders, which should rest flat on the bed itself; a firm flat cushion, about three or four inches thick, should be placed under the pelvis; the knees should be moderately raised and flexed, and kept wide apart—held thus, if necessary, by an assistant on the side opposite to the operator.

The ether having been administered, I always take a conical steel bougie or dilator, about, say, 12 at the point and 15 or 16 two or three inches higher up and pass it through the urethra.

If the meatus does not admit the bougie, at once divide the floor of the urethra there with a scalpel or urethrotome. If the bougie now passes with perfect ease the required space exists and the operation commences; if not, a smaller one is employed, and dilatation by means of two or three of these instruments passed one after another will probably accomplish all that is necessary. Of course, if any notable stricture is present it must be dealt with as such; moreover, its presence ought to be determined beforehand, and is not to be first discovered when an operation for crushing is arranged to commence.

The lithotrite has now to be introduced.

I have already mentioned that there is a difference in the mode of introducing the lithotrite and the catheter. You know that in passing a catheter, we, in this country, stand on the left side of the patient; in France, the surgeon stands on the right side. In passing the silver catheter for a recumbent patient, you hold it somewhat horizontally, draw the penis gently over it, slowly raising the handle to the vertical position and then with a gentle sweep depressing it towards or between the thighs, when the extremity of the instrument rises into the bladder.

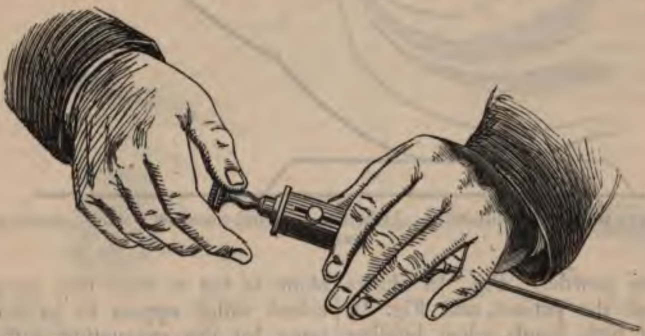

FIG. 47.—Manner of handling the lithotrite in the bladder when searching.

In passing the lithotrite a different movement is required. You may stand on either side, but it is better to be on the right side, as already directed, because that is the convenient side for operating, while it looks awkward and wastes time to go round from the left to the right of the patient to operate after having passed the lithotrite. Well, then, standing at his right side, and partially turning your left shoulder to his face, you hold the lithotrite horizontally in your right hand, introduce the blades, gently drawing the penis over them as you slowly traverse the urethra with the instrument some four inches, during which the shaft gradually rises nearly to the vertical position. Arrived at this point, you retain it in that position for a few seconds, allowing it to go on sinking, as it were, by its own weight, still vertical, until the blades have slipped beneath the pubic arch. This done, you gently depress the handle towards the thighs, and the opposite end slides readily into the bladder. There is no more easy instrument to pass than the lithotrite with proper management.

Having thus introduced the lithotrite, I have now to find the stone and seize it. In order to do this, I hold the cylinder lightly but firmly in my left hand, taking the wheel-shaped handle of the sliding shaft which is attached to the male blade in my right, and draw it outwards so as to open the blades within the bladder

(Fig. 47). Having done so, I then merely press it inwards and close the blades; and almost certainly that simple action ensures that the stone will be found between them. I then draw towards me the little button on the cylinder with the thumb of the right hand, which action changes the sliding movement into a screwing one, turn the handle and crush. I then push back the button, again open and close the blades, and again have a fragment between them, when, by moving the button, the screw is again at my service and I crush the fragment into powder. Fig. 48 shows the position of the patient, and Fig. 49 the action of both hands, when holding firmly and crushing. This process is repeated several times until a fair quantity of débris has been made, and, if the stone is not a large one, no pieces are seized which appear to be too large to issue by the evacuating catheter. In this manner, some eight or ten minutes may have been occupied. Sometimes a fragment escapes the lithotrite because it lies somewhat deeply behind an enlarged prostate. Or the stone may be small and lie there, escaping your search. You open and close the blades, and find nothing. Turning them to the right, and to the left, you still find nothing. You must then depress the handle of the *lithotrite, and turn it half way round,* so that the blades are reversed and point downwards; you will open and close, and then perhaps seize a small fragment deep behind the prostate. (*See* Fig. 50.)

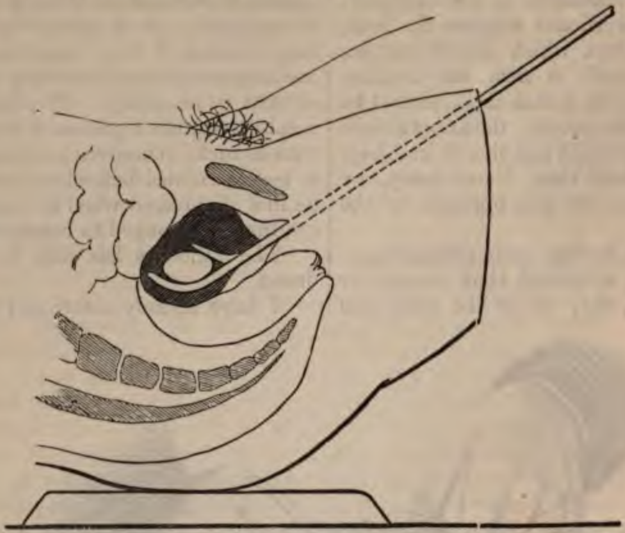

FIG. 48.—Ordinary position for lithotrity. Lithotrite open and closed on a stone: showing relations of parts.

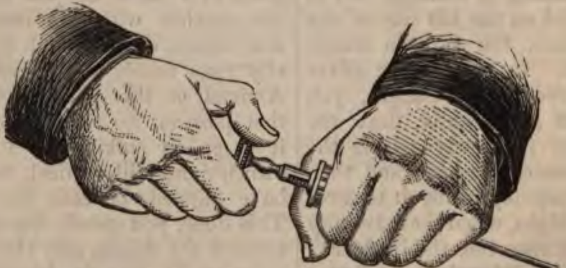

FIG. 49.—Holding the lithotrite firmly and crushing.

Now, let me give you a hint about crushing, which is a very useful one. Whenever you have found a stone, or a good-sized fragment, and have crushed it, keep the lithotrite exactly in that place, and although you may have had some trouble in finding the calculus, you will now continue to find it several times running. It has often reminded me of fishing for perch; when you have caught one, you may catch, perhaps, twenty or thirty more out of the same hole, if you will but stop there, and not go fishing about among the shallows. So in lithotrity, you may continue to seize and crush if you contrive to keep the lithotrite precisely in the same place. In fact, there is what may be called a certain favourite 'area' in every bladder in which to operate—a certain spot which is a favourite haunt, so to speak, for fragments of stone. If you find that out in each bladder, you will always be able to crush the fragments; if you do not, you may often have some difficulty in discovering them. The area will, of course, vary somewhat with the position of the patient. When the patient is standing, for instance, the area is not the same as when he is in a lying posture. It is then desirable to raise the pelvis two or three inches, in order to get an area for operating which is not too close to the neck of the bladder. The neck of the bladder is a very sensitive part, and you should always avoid injuring it, and in drawing out the male blade you may easily hurt the neck of the bladder if you are not careful. One of your maxims in lithotrity should be never to pull out forcibly the male blade. You should pull it out carefully and delicately, so as to *feel* the neck; and it is a bad lithotrite, if the male blade does not slide with perfect ease; so as to enable you to perceive the slightest contact with the neck of the bladder when, in opening the jaws, the male blade is drawn towards it. The diagrams Fig. 48 and Fig. 50, with the lithotrite in the bladder, will show what I mean by the area for operating. If the patient is lying without a cushion, it will be nearer the neck of the bladder than if the pelvis is well raised. It is more essential in the case of an enlarged prostate to put a high cushion under the pelvis, in order to throw back the fragments to the posterior part of the bladder, so that the area may be as far from the neck as possible.

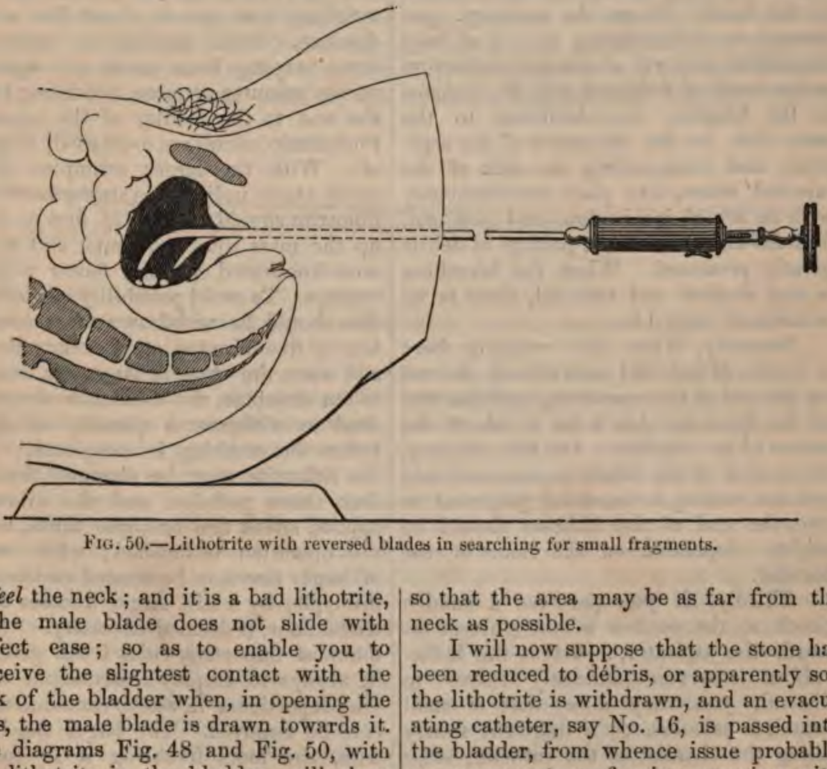

FIG. 50.—Lithotrite with reversed blades in searching for small fragments.

I will now suppose that the stone has been reduced to débris, or apparently so; the lithotrite is withdrawn, and an evacuating catheter, say No. 16, is passed into the bladder, from whence issue probably an ounce or two of urine, carrying with it some pulverised material into the vessel which should be ready placed to receive it. Holding the end of the catheter in the left hand, the aspirator, ready filled with warm water, is taken in your right and attached to the catheter, the communicating tap is turned, and the right hand makes pressure and drives part of its contents into the bladder. On relaxing pressure the outward rush is seen into the spherical glass receiver, and usually numerous fragments, often most numerous at the very end of the current. This alternate entry and exit of fluid is maintained by the right hand several times, with a few moments of interval between each, by which time there is often a goodly collection of débris in the receiver, and the action is repeated until débris ceases to pass, or nearly so.

Now, there are two or three maxims for the management of this apparently simple proceeding. First, let the act of injecting water into the bladder coincide with the act of expiration of breath by the patient, especially when the respiration is deep and full, as it often is when ether is inhaled, and you will find no resistance to the hand. If, on the contrary, you attempt to inject during an act of deep inspiration, you will encounter obstruction to the entry of fluid and will do violence to the bladder. In obedience to the same law, let the expansion of the aspirator, and consequently the exit of the injected water, take place synchronously with an act of inspiration, and you will find the current and the passage of débris greatly promoted. When the breathing is very shallow and tranquil, there is no occasion to regard it.

Secondly, When after crushing there is much débris still unremoved, do not let the end of the evacuating catheter rest on the floor, but let it be at about the centre of the bladder. On the contrary, when most of the débris is removed, and you are seeking a remaining fragment or two, the end of the catheter should be slighty depressed on the floor of the bladder.

Thirdly, If you perceive a sudden check to the outflow of the current towards the aspirator, and that the india-rubber reservoir suddenly ceases to distend, you may infer that a small rounded calculus, or a fragment nearly filling the channel of the catheter, stops the way. In these circumstances, press rather smartly on the aspirator two or three times, so as to expel a strong current of water, and this will most likely displace the obstructing body and reopen the channel.

Lastly, It is worthy of note that the action of the aspirator often enables us *to decide whether the last fragment* has been removed or not. The rattle of fragments against the end of the evacuating catheter in the bladder is very distinctly heard and felt; and as these become removed, the rattle diminishes, until at last a single tap perhaps only is felt, proceeding from a single piece just too large to enter the aperture of the evacuating catheter. This may be crushed and washed out, and then, if nothing whatever can be felt or heard, a strong presumption exists that all has been removed. In short, the instrument is an excellent test of a completed operaation, as well as an excellent means of rendering it complete.

The proceeding which I have thus described is adapted to the great majority of calculi met with in the adult male: that is of uric acid or oxalate of lime weighing from one to about five or six drachms. Such require for removal a term varying from seven or eight to twenty minutes or more, according to the size and to the facility of the operator. Phosphatic calculi are more easily disposed of. With the larger examples of the group above indicated, a strong fenestrated lithotrite should be used at first to break up the mass into fragments, and then a semi-fenestrated one may follow with advantage. To avoid possibility of blocking, this should be withdrawn after using it four or five minutes, and be reintroduced: and when the stone is large, say from six to ten drachms, the evacuator should be used to withdraw a quantity of débris before the crushing is completed. Thus the lithotrite may be changed three or four times perhaps, and the evacuator applied afresh two or three times, before the operation is finished; while stones of larger size may be treated on the same principle, by a still larger number of introductions, if deemed necessary. One of the most important rules I can give you is, always to employ instruments which are proportioned in size to the stone which is to be removed. The larger the lithotrite, the more irritating it is to the passages: hence it should never be larger than the work to be done requires. I have seen great mischief, and even a fatal result occasioned, by employing a large lithotrite which has split the urethra, in order to remove a stone which might have been easily and safely disposed of by a lithotrite of small appropriate size. I cannot too strongly reprobate such illjudged or careless proceedings, which are not only disastrous to the unhappy subject of them, but discredit one of the most safe and certainly successful operations, when properly conducted, in the whole domain of surgery.

Immediately after a sitting, a hot linseed poultice may be placed above the pubes, and is a comfort to the patient. Pain and irritation are always much relieved by the repetition of this, or by very hot fomentation-flannels to the parts. The bowels should act the day before or on the morning of the sitting, so that the patient may not have to rise soon after the operation and make efforts at stool. But if he is suffering severely, say three or four hours after the operation—a condition, by the way, which is quite uncommon—a hot hip-bath, as hot as he can bear it for fifteen minutes, gives great relief. The treatment for the first three or four days in cases of large calculus is that of a mild acute cystitis: recumbent position, external warmth, frequent hot hip-baths, and small but frequent doses of solution of potash, just to neutralise the acidity of the urine. If the urethra is over-stretched or bruised, an india-rubber catheter may be tied in for twenty-four hours or so, but this is not frequently necessary; while if the bladder had previously lost the power of emptying itself, such an inlying catheter for a day or two is mostly better than frequent catheterism.

There is one rather remarkable circumstance which I have met with in a considerable number of the cases referred to, and which I confess I am not quite able to account for. It happens in a large proportion during the three or four days immediately following the operation, that the relief is considerable, that the urine is clear, that the bladder tolerates a large quantity, and the aspect of the case is one of rapid and unchecked convalescence. But on the fourth or fifth day a little excitement appears, the bladder becomes irritable, the urine is cloudy, and after twenty-four hours or so subacute cystitis is established, often destined to be troublesome for a week or two. I have remarked these phenomena so frequently that it is impossible not to look for their occurrence; and I am satisfied now that they appear in spite of precautions, and are by no means necessarily the result of an imprudence on the part of the patient. The liability pointed out, however, indicates that it is most desirable to enjoin the recumbent position, confinement to the room, a warm temperature (in cold weather), and care in every particular of management for at least some days after crushing a calculus, whatever its size.

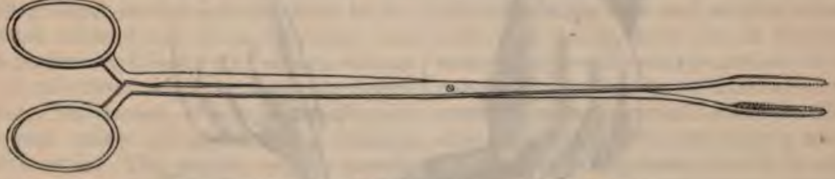

FIG. 51.—Long urethral forceps for removing fragments.

One troublesome circumstance that very rarely happens is the impaction of a fragment: and I think if you adopt the system of lithotrity which I have endeavoured to expound, you will very seldom meet with it. I have never had to open the urethra to remove a fragment in my life. I have occasionally had to remove one by the forceps, but that is very rare; and among the many complicated instruments which have been invented for this purpose, I know nothing so good as the common long forceps which I show you here. (Fig. 51.) During the last seven years, certainly, I have not had occasion to use them. The more thoroughly you crush and remove the stone, the less use there will be for forceps. Here is a bottle containing what I will venture to call a well-broken stone. You see it is almost powder: a very different product from that in the other bottle, where you see a number of large fragments that were probably passed with difficulty. It is an old saying, 'A carpenter may be known by his chips:' certainly the skill of the lithotritist may to some extent be known by the débris he makes. With large evacuating catheters and a good aspirator, such complete crushing is no longer so necessary.

It has been objected to lithotrity—and there was some truth, perhaps, in the gation formerly, but not now, if the operation is well done—that one is never quite certain of getting rid of the last fragment; that a portion may remain and become the nucleus of a future stone. But there is very little more difficulty in removing the last fragment than any other, provided we pursue the proper course. Generally speaking, in nine cases out of ten, the last fragment is removed as the preceding have been—that is, by the aspirator, which is now the chief agent in removing all débris from the beginning to end of the case. But suppose you have reason to believe that a fragment remains just too large to pass, judging from the continuance of pain, &c.—you then take a lithotrite with short wide-rounded blades, with which you can explore easily in the reversed position. With this instrument you may thus search the whole floor of the bladder with perfect safety. And for this purpose the cylindrical handle especially is of great value.

It is quite easy to procure an audible note from a fragment no bigger than a split pea, as I have times without number demonstrated in the wards and elsewhere, withdrawing the little bit entire after it has been struck for the purpose of verifying the observation. The handle of the lithotrite should be depressed, the beak turned downwards behind the prostate, and the forefinger of the left hand placed on the shaft an inch below the handle. Very slight and quick rotary movements, alternately right and left, should be made with the right fingers lightly holding the cylindrical handle, while the shaft turns on the end of the left index as on a pivot or fulcrum (*see* Fig. 52). With this form of handle, and with no other that I have seen, is this possible.

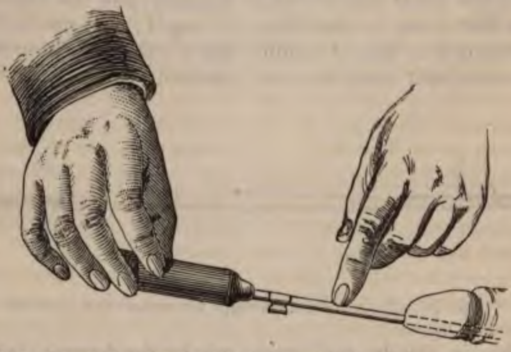

FIG. 52.—Mode of searching for the last fragment; the blades turned downwards.

By one or other of the means pointed out there ought to be no difficulty in detecting and removing the last remnant of a crushed calculus from the bladder. Nevertheless, it is true that when this has been done slight troublesome symptoms may still continue. This subject will be fully considered at our next lecture.

I may here state, in reply to a question often put to me, that for the purpose of acquiring the practice necessary to qualify you to operate, there is no doubt some advantage in becoming familiar with the proper mode of handling a lithotrite by using it in the dead body. But you will find a great difference between the sensations communicated to your hand by the movements of the instrument and the stone in the living and in the dead body. *The sensations in the latter* case are simply those of a stone lying in obedience to gravity at the bottom of a flaccid bag, which has no life of its own, nor any power of movement, and is subject simply to mechanical laws. In such a cavity the foreign body is uniformly found at one place, and cannot be missed. Totally different is the sensation of encountering a similar body in a living bladder. By no means does the stone appear always to obey the force of gravity, and to lie at what you believe to be the bottom of the viscus. Sometimes, indeed, it seems strangely otherwise. The bladder has movements of its own, which are doubtless aroused or called into activity by undue disturbance occasioned by instruments: and the result of these at times is strangely to displace, as one must imagine, the calculus sought. This is one of the reasons why a stone is more readily and certainly seized, when the lithotrite has been very quietly and easily introduced, without the disturbing influence of a preliminary injection; without, so to speak, awakening the resentment, if I may use the term, and reflex contractions of the bladder which it occasions.

I must briefly mention certain contingencies that occasionally arise in connection with the operation of lithotrity, some of which will be considered in their appropriate places in subsequent lectures. The first contingency to be referred to is fever; the second is bleeding; the third is cystitis just referred to; the fourth is orchitis; the fifth is retention of urine (see next lecture); and lastly exhaustion may occur which is sometimes fatal.

What is usually termed 'fever' is a series of phenomena, which denote a peculiar disturbance of the nervous system, the product of mechanical interference with the male urethra. Thus a slight over-dilatation of the canal with a bougie, and still more the occurrence there of some considerable lesion, may produce a febrile attack; while, on the other hand, severe injuries may be inflicted without any fever following. So in performing lithotrity by several sittings a febrile attack is by no means an unfrequent occurrence, although sometimes a patient passes through all his sittings without it. The attack, which usually commences within three or four hours after the occurrence which has provoked it, often directly after the first act of micturition which follows, is announced by a rigor lasting from ten to twenty minutes and pervading the whole body. The patient then gradually becomes hot, is flushed, restless, and thirsty; complains of pains in the head and back, or in the extremities, and of feeling weak. After an hour or two sweating takes place, and with it comes sensible relief to pain and restlessness, but the patient remains always more or less weakened by the attack. What I have now chiefly to say is, do not 'meet the symptoms' by a too active treatment. I can recommend no drugs in these circumstances as a rule; a moderate dose of opium being perhaps almost the only exception, since, for some, by no means for all, it acts as a restorative. When the patient is in the stage of rigor, let him be well covered with blankets, and let hot water-bottles be applied liberally: some hot tea is better than brandy and water, the popular remedy in these circumstances, as in many others where it is not merely harmless but prejudicial. As he becomes warm, remove the coverings cautiously, and let him have soda-water and seltzer, or toast and water freely, to quench the thirst which accompanies this stage; effervescing citrates are also agreeable and may be prescribed. The patient will have no relish for any solid food until the attack has passed off, and the pulse and temperature, which rapidly rise and which almost as rapidly fall, have nearly reached the accustomed standard again. Herpetic eruption about the mouth often follows.

The phenomena so described are not to be regarded as 'fever' at all, in the sense in which it is employed by the physician as denoting a specific malady. They simply indicate that a struggle, to speak roughly, is taking place in the system with greater or less vehemence against some poison which is in the process of being eliminated. The attendant has mainly to take care that the hygienic conditions are good, and that the patient's strength is restored, as far as possible, by mild nourishing diet and auxiliary treatment. However, there can be no doubt that one of the advantages attained by the one-sitting method, is the diminished frequency of these 'feverish' attacks. They arose, no doubt, from the cystitis set up by remaining fragments; for it is quite common now to remove large quantities of débris with a good deal of mechanical disturbance, and if the bladder be completely emptied, to find the patient free from any attack of the kind described.

Bleeding, as a result of the operation, is very rarely troublesome, and does not require much treatment. Cystitis gives a little trouble occasionally, and is to be treated in the ordinary way described in due course. Inflammation of the testicle requires us to desist for a time from operating. Chronic retention of urine is apt to occur very insidiously—not absolute, but partial retention. Always be on the watch for it after any sitting, if frequency of micturition increases, and the urine contains much muco-pus, and particularly if it becomes alkaline; in which case pass a soft flexible catheter with all the gentleness you are master of. If you find that the bladder does not empty itself by its own power, you must repeat the process once, twice, or more frequently, according to circumstances, in the twenty-four hours. If, however, the freshly passed urine is decidedly ac however frequently it is passed, you may spare the patient the catheter, and the pain which it is apt to cause in these conditions.

Sometimes a patient's strength has been miscalculated, or repeated attacks of fever have undermined it, and he succumbs without other known cause. Phlebitis occasionally appears; and with, or without it, deposits may occur in various parts of the body as the result of blood-poisoning. Such conditions are almost invariably fatal. Happily these are rare and exceptional circumstances, which lithotrity, like other operations, is liable to produce.

LECTURE XIV.

CONDITION OF PATIENTS AFTER LITHOTRITY IN GENERAL—RESULTS OF THE SINGLE-SITTING OPERATION IN PARTICULAR, IN REGARD FIRST, OF MORTALITY; SECONDLY, OF THEIR SUBSEQUENT CONDITION. RÉSUMÉ OF EXPERIENCE RESPECTING IT.

THE most common course of a patient's history subsequent to the operation of lithotrity is—and I say this after an experience as you know embracing many hundred cases carefully watched and inquired after—a complete immunity from the reappearance of calculus, and immunity also from troublesome urinary symptoms. There are literally scores of men now enjoying life, free from their former symptoms, in each of whom a successful operation of lithotrity has checked, once for all, the pain and danger incident to the presence of a stone in the bladder. Besides these, there is a certain proportion of patients in whom stone re-appears; a circumstance more commonly observed, indeed, of necessity more evident, since the introduction of lithotrity than before. These form two very distinct classes: the one consisting of individuals with a strongly-marked tendency to produce uric acid, and who continue to form calculi of that material during many years. On several patients I have operated for no less than three consecutively formed uric-acid calculi; intervals of three or four years elapsing between the formations of these calculi, while in two patients I have done this four times; one of the last-named instances is living and engaged in an active mercantile life at this moment (1882) at the age of seventy-four years. When lithotomy was the only mode of removing stone, these patients were unable to submit so frequently to operation as they now are; moreover, it was much oftener fatal than is lithotrity, and, therefore, but too effectually sometimes prevented the possi*bility of fresh formation!*

The other class consists of that large number of persons who, most commonly from the presence of hypertrophied prostate, have lost the power of emptying the bladder by the natural efforts, and habitually retaining decomposed and alkaline urine, sometimes become the subjects of phosphatic calculus. This although removed entirely by the lithotrite often reappears in spite of much precaution; and many persons now owe their lives entirely to the fact, that once or twice a year some phosphatic matter, a small concretion or a semi-solid mass, not worthy to be regarded as a calculus, is easily and safely removed by the lithotrite and aspirator. And many a man's life is prolonged and rendered tolerable on such conditions; a result which also was not possible when the only mode of removing this material was a resort to the knife.

I referred in our last lecture to the continuance of frequent and painful micturition—to the persistence, indeed, of slight chronic cystitis—as a phenomenon occasionally met with after lithotrity; and this, notwithstanding that we have satisfied ourselves by sufficient exploration, that every fragment has been completely removed from the bladder. Cases of this kind form another class closely connected with the last named as we shall see, and it is with their management that we shall occupy ourselves to-day.

The first inquiry you are to pursue under these circumstances consists in ascertaining whether the patient quite empties his bladder. Let him first pass all the urine he can, then introduce a soft catheter, and mark how much is left behind. If you draw off only three drachms of urine, which may be a little cloudy perhaps, you will probably afford him relief, and may clear up the case. It is quite remarkable how small a quantity of residual urine will give rise to pain and irritation, and that so insignificant an amount may, if neglected, gradually increase and form a nidus for the deposit of a phosphatic stone, and so lead to bitter disappointment in the place of what might have been satisfaction at a successful result. Let me say at once that negligence in relation to this matter is the chief cause, beyond all question, of the subsequent troubles which occasionally become evident at an early period after the stone has been removed, and which have constituted, in a certain proportion of cases in elderly men, sources of discredit to the crushing operation. In the cases referred to, the calculus may have been removed easily enough, some little cystitis, but no other trouble having occurred during the procedure; but it becomes evident afterwards that the frequency of passing water is not remedied, and small pains and discomforts still continue. The patient leaves his surgeon, and reappears in a few months, or even weeks, passing clouded, perhaps alkaline, urine, depositing triple phosphates, and with his local symptoms aggravated. These phenomena may sometimes be due to the escape of a small fragment into a sacculus in the bladder, where it becomes the source of irritation, phosphatic deposit, and occasions the formation of a fresh vesical calculus, with ceaseless discomfort and requiring repetitions of the crushing process to relieve it. In a large majority of cases, however, this is not the cause, and the symptoms in question are due to another cause, which is often in a great degree preventible. For these after-troubles may appear in patients who have had very little uneasiness antecedent to the operation. Their stones have been small, and their bladders have been in excellent condition; no ground, therefore, can exist for supposing such patients to be the subject of sacculus in the bladder. Every presumption, indeed, is opposed to that view, because sacculi, as a rule, do not form without the existence of an obstruction to the outflow of urine, which has been in operation for a long period of time.

Now, the particular fact which I am going to state is one I was scarcely aware of twelve years ago. I have long been aware of the necessity of carefully watching patients during lithotrity for any sign of inability to empty the bladder, have long also invited attention to the insidious manner in which that inability commences, and pointed out that it must be dealt with by the habitual use of the catheter. But I have only learned during the last few years how extremely small a quantity of urine habitually left behind in an elderly patient's bladder after each act of micturition, provided that he is undergoing, or has just undergone, lithotrity, suffices to lead to phosphatic deposit and to chronic cystitis. You will scarcely believe me that one drachm, or one drachm and a half, only of this residual urine is enough in exceptional cases to produce the condition so feared and detested by every lithotritist;[1] and I now add, that if the condition is detected early, and this small quantity is promptly and frequently removed by the patient himself, which he can easily do with a soft *coudée* catheter, almost certainly the dreaded symptoms will not appear.

I have been surprised at the result; not less surprised than I have been at the fact that the patient who towards the close of lithotrity, or afterwards, is making urine every hour or so, and who, on passing his catheter, finds only one or two drachms behind, often obtains at once an interval of three hours or more. Such an one should pass his instrument at least three times a day until he regains the power to empty the bladder completely by his own efforts. I confess that formerly so small a quantity of urine did not seem to me worth the trouble of removing; as I assumed, on theoretical grounds of course, that it could not be of any importance. I now know that the practice of removing it constitutes for many cases the difference between a permanent success and an ineffectual result and painful future.

Now then, how does the plan of crushing for cystitis, referred to under the preceding head, affect, as I said it would, also this important question which we are now discussing? Thus: it is precisely in those cases where the treatment has been prolonged, or where cystitis, either acute or chronic, has been allowed to go on unchecked, that the inability to empty the bladder is most likely to occur. Again, this inability, once commenced, very rapidly becomes the established order of things in elderly people, unless it is checked at the outset. Once let the bladder be accustomed to the smallest degree of accumulation of urine, and the power to empty itself entirely is, after a certain age, often permanently lost. The best chance of preventing this, and the phosphatic deposit which results, is, in the first instance, to avoid or diminish cystitis during the treatment by lithotrity in the manner described; and, secondly, to teach the patient to empty his bladder himself towards the close of the operative proceedings or immediately after, if the smallest failure to empty it is detected. Once for all, let me say, I cannot exaggerate the importance of these recommendations.

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[1] It is not to be supposed that I regard so small a quantity as equally important in a patient whose urine is clear, who is not the subject of any chronic cystitis, and who is not undergoing lithotrity. In an elderly man the presence of a drachm or two of 'residual' urine suggests that at some future time he may require the catheter, but certainly it would not yet be necessary.

Now, when this tendency to produce phosphatic deposit has been unfortunately established, we are often able to benefit the patient by teaching him to wash out the bladder once or twice a day with warm water. For this purpose the four-ounce india-rubber bottle, with brass nozzle and stopcock fitting the catheter usually employed, is the best instrument—one-third only of its contents is to be injected at a time, and this quantity is to run out before the suceeding third is introduced. To the water should be always added either carbolic acid in the proportion of one grain to the ounce, or the solution of the permanganate of potash (Condy's), six or eight minims to the ounce. Either of these disinfectant solutions, the first-named being perhaps mostly preferable, should be employed as preliminary to all other injections; they are not in the slightest degree irritant to the bladder, and they deodorise and cleanse the interior. Further, and this is a fact of some importance, carbolic acid does not decompose any solution of metallic salts which it may be desirable to inject afterwards or in combination.

The bladder being thus kept in good sanitary condition, the next consideration is, what agents are to be employed to *promote healing action* in the diseased mucous membrane? The best are salts of silver, copper, and lead, very weak solutions of which should be used at the first occasion of applying them; watching carefully the result before augmenting their strength, and doing so very gradually. The nitrate of silver should not at first exceed in strength the proportion of one grain to four ounces of distilled water; even one to six ounces is preferable if a patient is more than usually susceptible. It should always be preceded by a cleansing or deodorising injection to remove from the surface to be acted upon the muco-pus which is coagulated by the solution of silver, and tends to hinder contact between the mucous membrane and the agent. If very little inconvenience follows, a slightly stronger solution should be used after an interval of two or three days, always avoiding an increase in strength sufficient to produce any severe or long-continued pain.

But of late I have adopted a further extension of this method, and with manifest advantage. I advise the patient (who may or may not be habitually using the catheter to empty his bladder) to use every second or third day the following apparatus:—

(1) A black flexible catheter, No. 11 or No. 12 in size, made thin, and with polished interior, so as to facilitate the passage of débris through it (a great improvement on the ordinary French flexible catheters, which are thick and have often rough interiors), and having a large oval eye on the upper surface of its extremity, which is slightly turned upwards (*coudée*). (Fig. 53).

(2) An eight-ounce india-rubber bottle, with a brass nozzle (B) which fits *over* the outer end of the catheter, and not into it. The manifest result of this mode of attachment is, that a powerful uninterrupted current can enter and issue from the bladder; indeed, it is scarcely possible that débris should remain in the organ under the influence of the action of this apparatus, as any one can perceive on using it. It may also be used as an aspirator, with a backward and forward current, if desired. For the patient's own use it is even more easy than the ordinary four-ounce bottle, which I have long been in the habit of desiring him to apply, since the size and freedom of the channel —not narrowed at the point of contact between bottle and catheter—permit the

fluid to be propelled with very slight pressure.

I come now to a very important subject in relation to the practice of that particular form of lithotrity which I have taken upon myself to commend to you, as a great improvement of the old operation conducted at several sittings: I mean the operation which is completed, in almost every case, at a single sitting, and ends with the entire removal of the stone. I could not recommend the operation to you until I was warranted in doing so by a considerable experience. I dare not take so weighty a responsibility on my shoulders, unless I could produce before you results, not only on a large scale, but results of a very unmistakable kind.

The points before us now are:—

First, what is the mortality following the operation? secondly, what is the subsequent condition of the bladder, at some distance of time after the operation has taken place?

In relation to the question of mortality I may say, that during the last three and a half years, I have employed this method almost entirely; and for the last two years, without any exception. During this term I have operated on 112 consecutive cases of elderly men—that is, *on* 112 *separate individuals*, no one individual having required during that period to be operated on a second time.[1] I have included no case of mere phosphatic concretions, which frequently require to be crushed for patients who pass all their urine by catheter—urine which is alkaline and liable to deposit phosphates. These are not cases of 'stone in the bladder,' and have no right to be so regarded. The mean age of the 112 individuals is over sixty-two years and a half. The number of uric-acid calculi is sixty-four, of oxalates four, of mixed calculi fourteen, and of phosphates thirty. *The number of deaths is three only.* This is a better result than I have ever before accomplished. I have operated on a similar number by the old method, once with six deaths, but the average of upwards of 400 cases reported

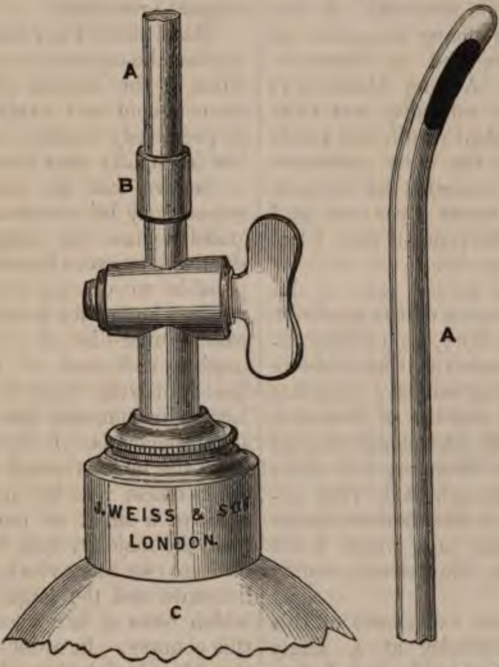

FIG. 53.—A, the catheter described. The actual measure of the drawing is No. 9. It will be understood that the size indicated is usually No. 12. B, the nozzle of the bottle, which fits *over* the end of the catheter, A.

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[1] Eighty-nine of these cases were reported, each one with the weight of stone and name of his medical attendant with whom I saw the case, in my paper on the subject at the International Medical Congress in August last. The twenty-three remaining cases have been operated on since.

to the Royal Medical and Chirurgical Society was 7½ per cent. mortality. I am sanguine enough, therefore, to hope, judging from this experience, that the mortality of the stone operations is reducible by the single-sitting method materially below that of any previous one. Never, I believe, has it in the history of surgery hitherto fallen to the lot of any man to operate for the stone on 112 elderly male patients with only three fatal cases. The once famous eighty-four cases of Martineau, with two deaths, contained only twenty-four over fifty years of age (only eleven indeed over sixty) *and in these the two deaths occurred.* A few among the rest were young men, *the majority were children*, and in these no deaths took place. Among Martineau's elderly patients the mortality was fully 8 per cent., an excellent result, and rarely attained by any of the older operators. The mortality now recorded in consecutive adult cases of under 3 per cent. is, I confess, a better achievement than I had ever ventured to hope for.

We devoted the former part of this lecture to a consideration of the condition of patients after lithotrity, from a long experience of that operation as it has hitherto been performed. And we have seen that in a certain limited number of instances, chronic cystitis with phosphatic deposit occurs. Even after lithotomy this event is not unknown, although it is very uncommon. I have at this moment under my care an obstinate case which I cut eighteen months ago, the primary results being excellent.

Now, what is our experience of this complaint after lithotrity at a single sitting? It has been said, but I fear hastily, that this operation has banished these unhappy cases from practice. I regret to say, indeed, that so great an advance, cannot be affirmed. I think one of the worst, one of the most persistent, examples of phosphatic cystitis I have seen of late years followed an operation in which I removed with great ease a small uric-acid calculus (eighty-four grains) in six minutes, not quite two years ago. Gradual improvement has taken place, but for a few months frequent micturition, much pain, and repeated production of phosphatic deposit were experienced. A similar case occurred about the same time, but this recovered soundly by the followg spring. In four other cases of the series referred to there was persisting cystitis for three or four months after the operation, but not longer. All these are cases in which the calculus was uric acid, and cystitis was not present before the operation. When the calculus has been phosphatic, removed from a bladder habitually emptied by the catheter on account of large hypertrophy of the prostate, and cystitis has pre-existed, it is almost invariably much lessened by the operation; but its continued existence in such a case to some extent is often a necessary concomitant of the organic changes in the organs, and involves no discredit to the surgical procedure.

But I think I am justified in concluding that the occurrence of the morbid condition of the bladder following lithotrity for uric-acid and oxalate-of-lime calculi in previously healthy organs is observed less frequently than heretofore. I venture to believe that the improvement in this respect may be considerable. In order to guard against the danger, our first care should be to avoid in every case where it is possible to do so, the use of instruments, whether for crushing or evacuating, which over-distend and irritate the urethra and neck of the bladder. At least our rule must be not to employ larger instruments than the size of the stone demands. I cannot too earnestly warn the inexperienced lithotritist against the needless risk he incurs when, in presence of a small or moderate-sized stone (and the majority met with belong to one of these two categories), he uses the heavy lithotrite and the large evacuating tubes which have of late been introduced into this country. In order to remove two or three hundred grains of calculous matter from the bladder—and many calculi weigh less than a hundred grains, while all ought to be found before they attain that weight—it is wholly unnecessary, I will even say it is unwarrantable, to introduce lithotrites and evacuators with the diameter of No. 18 or 20 English scale into the bladder. I am certain that the mere splitting, for it is not dilatation, of the urethra and neck of the bladder, which sometimes follows the introduction of such instruments, has sufficed to produce symptoms often distressingly painful, sometimes obstinate in duration, occasionally fatal. Surely it is more prudent to bestow two or three minutes more on the work, to ensure more complete crushing, so that the débris may be removed by a tube of 15 or 16 English diameter, than to crush coarsely and use an evacuator which infallibly inflicts serious mischief in a certain proportion of cases.

I will briefly sum up our subject thus: Lithotrity completed at a single sitting is in experienced hands an operation unequalled in its safety for the patient.

It appears also to produce less subsequent persisting irritation of the bladder than the operation by several sittings.

No new form of instrument is required by this operation.

The value of the proceeding lies altogether in the removal of all the foreign matter from the bladder at once, so that nothing remains to excite inflammation in an organ already irritated by the process. And the less irritating the operation has been, the more certain and more speedy will be the recovery.

It should be employed by beginners only for calculi of moderate size when hard. If calculi are large as well as hard, a young surgeon will probably proceed more safely by lithotomy. In friable phosphatic calculi, size offers a much less serious difficulty. Lithotrity at a single sitting for a hard calculus, upwards of an ounce in weight, and *à fortiori*, when double that weight, certainly demands an experienced operator.

LECTURE XV.

ON LITHOTOMY IN MEN, WOMEN, AND CHILDREN.

Gentlemen,—It was understood, as the result of our discussion in the first lecture on Stone in the Bladder, that all cases below the age of puberty, with very few exceptions, should be cut; those only in which the stone is extremely small being reserved for lithotrity. Then there were certain adult cases, where the stone is very large, or other difficulties exist, in which the operation of cutting must be performed. Hence we have next to study the operation of lithotomy, and this advantageously follows the consideration of lithotrity.

The proceeding of 'cutting for the stone' has always been a subject of extreme interest; indeed, you will find no operation that has a greater fascination for the veteran operator, while there is none which more excites the ambition of young surgeons. There is no achievement which a former student is so ready to come here to tell his teacher of, as this, 'I have just successfully cut my first stone case down in the country,' and he does so with laudable pride and a happy sense of newly acquired power. On the other hand, the true surgeon who loves his art is always profoundly interested when the theme of discussion embraces the history and practice of lithotomy. And as I believe that some acquaintance with the former is one of the best ways of commencing a study of the latter, I will give you a slight sketch of this extensive subject (for its entire literature would suffice to stock a library)—that is, of the different stages by which lithotomy has arrived through earlier periods at its present condition.

The first description we possess of the operation of lithotomy appeared in the Augustan era, at which time it had been performed some hundreds of years, among the Greeks and Romans. I shall speak, therefore, first of lithotomy under the Classic period; and the operation then described continued to be performed, as far as we know, throughout the Middle Ages. Secondly, I shall give a sketch of improved methods which arose with the revival of letters; and lastly, of the operations adopted during the last and present centuries, marked as this period is by disregard of ancient authority as the sole and sufficient guide in all matters which are determinable by experiment and observation. I dare say there was an earlier period than any of these, and if some enterprising Lyell in relation to surgery, would make the inquiry, he might find traces of a pre-historic period: because, wherever there are human remains, calculi must exist. I do not know how long uric-acid stones might be expected to endure. We know that the excreta of fishes have been preserved for many thousands of years, and I doubt not that some of these human excreta might be found also, and that oxalate-of-lime calculi, at least, must exist among other human remains. As so many observers are seeking the early records of the human race, I throw out the hint; and certainly, if I were so searching, I should not forget to seek, among other things, the matters in question. Whether we shall thus ever find any instruments which could be identified as the means by which those stones may have been removed is extremely doubtful.

We will, however, not occupy our time with speculation, but will be satisfied to begin with such facts as we can find, say about 2,300 years ago. The first allusion on record is in the works of Hippocrates [born B.C. 460], who obliged his pupils to take an oath that they would never practise lithotomy, but leave the operation to those who were in the habit of performing it; thus indicating his sense, at all events, of the gravity of the proceeding, which he appeared to think too hazardous for men to undertake who were not specially trained for the purpose. To such he recommended that stone cases should be left; it is clear, therefore, that at this early period the operation was recognised as an established surgical procedure. But it was practised, not as any part of general surgical duty, but as an occupation by itself, and, at any rate in the estimation of physicians, not a very exalted one, being only in the hands of certain itinerant performers. After this, Celsus, who probably flourished about the commencement of the Christian era, described the operation as it was practised by these men. In his seventh book he gives the details, and termed it 'cutting on the gripe.' The method was simple, and so were the instruments, on which account they were long afterwards termed the 'apparatus minor,' to distinguish them from the 'apparatus major' of another operation, which came into vogue in the second period. The ancient or classical method was thus conducted. The operator commenced by placing his patient, usually a boy, upon the knees of a man who was seated. If it was an adult patient (but such were rarely cut), two men sat side by side (their legs forming the operating table), so that their arms might clasp the patient and control his struggles. The operator used no staff whatever, but inserted two or three fingers into the rectum, and endeavoured so to feel the stone, which he could only do when it was large. If he succeeded in recognising it, he firmly fixed, or 'griped' it with the ends of his fingers—hence the term 'cutting on the gripe;' and pressing it down towards the perineum, he made a semi-lunar cut with a broad scalpel until he reached it. Then, if unable to press it out with his fingers, he drew it out with a hook. Now, this very rough proceeding universally prevailed until about the sixteenth century; indeed, up to the seventeenth century it was largely practised in Europe. Even in the latter part of the seventeenth century, when Frère Jacques appeared, the ancient mode of cutting on the gripe was chiefly practised.

We now reach the second period, or that of the Renaissance, when at least three different operations appeared. Appropriately enough, too, a brother of one of those monastic orders which had cherished and exercised most of the arts hitherto, figures now as the most famous operator.

First, we will consider the 'Marian method' or 'apparatus major'—a median operation, originated by Johannes de Romanis, but receiving its name from his pupil, Marianus Sanctus, who published the first account of it A.D. 1524. It is called the 'apparatus major' because, while 'cutting on the gripe' required only a knife and a hook, this small table would be scarcely large enough for the instruments employed for the Marian operation. They are not here, but you may see them at the College of Surgeons. By this method, a simple cylindrical staff having been introduced into the bladder, a vertical incision was made by the side of the raphé, and the urethra was opened on the staff at about the membranous portion. A dilator was then passed into the wound, and upon that another (male and female dilators they were called), and the canal and the neck of the bladder were torn asunder with great rudeness. Its only resemblance to the present median operation is, that the incision is in nearly the same place. But anything more barbarous than the practice you can hardly conceive. The stones were larger then than they are now, and the incision was small; and in order to dilate it and extract the stone, various instruments were devised or modified from still earlier forms, some of them being the origin of several surgical instruments now in use. But in practice, the Marian proved to be a very unsuccessful operation, and was gradually abandoned in consequence. Still it held its ground in places, and for certain cases, as late as to a part of the eighteenth century.

Next I shall name the high or suprapubic operation, which appeared at the end of the sixteenth century, and, being useful in a few exceptional cases, has maintained a position of greater or less importance to the present day. More than that I shall not say now, as we concern ourselves mainly with perineal lithotomy.

I now come to a new proceeding, which rudely shadowed forth our present lateral operation. It was performed on a staff, which was not grooved as now, but yet it roughly served as a guide into the bladder. The operator commenced by thrusting a long knife into the ischio-rectal fossa, and so on into the bladder behind the prostate, and, cutting forward, he made the entire wound at one incision. Invented, as it was believed, by Pierre Franco (about the middle of the sixteenth century), its apostle and promulgator was the celebrated Frère Jacques, who flourished in the latter part of the seventeenth century, and is said to have cut 5,000 times for stone. It is far more than probable that he did not cut 500; but an error of a cipher more or less was a trifle for the inexact and credulous mind of the period. Like others of his craft he was an itinerant operator, not at first embarrassed with too much knowledge of anatomy, although later in life he studied it seriously in Paris; after which, it is said, his operations were less successful. He then pursued his practice mainly in France; and subsequently, a similar operation was performed by Rau, in Holland, who obtained much celebrity there.

It will be interesting to you to know what was going on meantime in our own country. Most patients, up to the end of the seventeenth century, who were cut, submitted either to the old operation 'on the gripe,' or to the 'Marian.' In the beginning of the eighteenth century the supra-pubic operation was first practised here. At this period there came to London a Leicestershire lad, subsequently known as Cheselden, the celebrated surgeon of St. Thomas's Hospital; and he at first, like others, performed the high operation. But he had heard of the recent successes of Frère Jacques' method, and tried it, modifying it as an increasing experience suggested, until he performed almost exactly what we now call the lateral operation, and with the best results. His success was so great, that in 1729, when he had performed the operation several years, and cut about one hundred patients—a very large majority of whom, by the way, were children—Morand, the French surgeon, was sent from Paris to see him operate, and report upon the subject. He remained here for some time, Cheselden collecting a number of cases and operating on them before him. Morand then returned, and reported to the French Academy so favourably on the subject, that Cheselden's operation became generally accepted there as the best. When operating on the adult, Cheselden made the deep incision, if possible, strictly within the limits of the prostate gland, and involving its left side only, using a scalpel of moderate size, and cutting inwards along the groove of the staff. A few years afterwards Cheselden retired, having cut 213 patients, of all ages, with ten deaths.[1] Those are the first figures that we can depend upon in connection with the operation, for, as I have told you before, the figures of the mediæval period are monstrous and incredible; for not only was the famous monk said to have cut 5,000, but to have lost 'scarcely any.' Cheselden, who had carefully studied and improved the method, and who, like Frère Jacques operated on a few adults, but chiefly on children (whose cases you know are rarely fatal) met with barely five per cent. of deaths, which was a most successful result, and no doubt the best that had been yet made.[2]

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[1] Of these 213 cases, no less than 105 were under 10 years of age, of whom 3 died; 62 were between 10 and 20 years of age, and of these 4 died; only 46 were above 20 years of age, and of these 13 died.—Cheselden's *Anatomy*, 5th edition, 1740, pp. 322–3.

[2] There is also a famous series of stone operations which is very frequently referred to as perhaps the most successful on record, performed by Martineau, of Norwich, and reported in the *Medical and Chirurgical Transactions*, vol. xi. p. 402, 1821. The number of patients was 84; amongst whom there were only 2 deaths. The operation was, of course, in all, lithotomy. They occurred between 1804 and 1820 inclusive—a period of seventeen years.

In arriving at the exact results, it appears that here also a very large proportion were children.

At this point the operation continued for some years until the end of the century, and then 'the gorget' came into fashion. A few years ago a patient was rarely cut without it; now, I suppose, few of you know what it is. Originally one of the directors used in the 'apparatus major,' its edges were sharpened for the purpose of making the deep incision through the prostate. This was the idea of Sir Cæsar Hawkins, whose name was affixed to it; but subsequently almost every surgeon had his own gorget, making it wider or narrower, or altering it in some fashion or another. A great deal of mystery has been made of this instrument, but it is simply a wide knife with a beak or probe-point at the end, which is carefully maintained in the groove of the staff. In employing the ordinary knife, if you require a deep incision, the blade must perhaps leave the staff a little. The object of the gorget is to make an incision sufficiently deep without leaving the staff. Here is one which formerly belonged to Scarpa, the celebrated anatomist, and here are others which, having been used by many celebrated operators, have fallen into my hands, and they are leading types of the instrument.

In France at this time the lithotome caché of Frère Come was much used, and with the same object in view, viz., of attaining certainty and precision in the extent of the incision through the prostate. The practical difference between it and the gorget is, that in the latter the division of tissues is made by pushing inwards a sharp blade of known width through them: and that in the former a sharp blade is opened to a known extent at the farthest limit of the parts to be cut, and is drawn outwards to the operator, dividing them.

In 1816, Dupuytren, of Paris, not being content with the lateral, introduced his bilateral operation. His object was to make the deep incision by a cut on each side of the prostate, instead of a large one on the left side only. And he, with the same view of limiting accurately the extent of the wound, designed a special instrument for the purpose. This, the 'two-bladed lithotome,' is also a member of the ancient surgical armamentarium, made more elegant and manageable by modern skill. Here again, instead of making the internal incision by pushing a cutting blade inwards, as with the knife or gorget, you carry this instrument [showing it] into the bladder along the staff, there open its two concealed blades, and drawing it towards you, these cut their way outwards. The blades can be arranged so as to have the incision as wide or as narrow as you please.

In 1825 or 1830, the 'median operation,' often loosely spoken of as a revived Marian operation, came into some note in this country, while in Italy it had been long previously employed with much success. In the meantime Civiale, in Paris, combined the median and bilateral operations in one proceeding, which he called the medio-bilateral; and you have seen me frequently perform both of them here; they shall be briefly described hereafter. Subsequently, Nélaton devised an operation to which he gave the name of 'prerectal.' This may be fairly described as a bilateral operation, conducted by means of a carefully made dissection for the purpose of obtaining more space between the rectum and the bulb of the urethra, and especially to avoid wounding the latter. More recently still, the late M. Dolbeau, of Paris, adopted a method, by no means before untried, of making a median perineal opening into the prostatic urethra, which he dilated by expanding metallic dilators, crushing the stone through it, and removing all the débris at one operation. It has generally proved to be a tedious proceeding, requiring much instrumental contact with the bladder after all the urine has escaped; and it is there-

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while 6 were females; deducting these latter, there remain 78 male cases, of which not less than 34 were under 15 years of age, leaving only 44 adults. Of these 44 adults, no more than 11 were upwards of 60 years of age; only 24 were 50 years old and upwards, giving for the latter a mean age of 62½ years; the 2 deaths occurred among them.

No error is more common than that of comparing lists of cases without noting this most important element of age. Death after lithotomy in children is notoriously infrequent; indeed, it is a result scarcely to be expected, unless under circumstances of some rarity. During middle life, also, lithotomy is a very successful operation; but at the age of sixty and upwards it is one of considerable risk. Hence, unless an exact statement respecting the patient's age is afforded, no inference can be drawn from any number of cases of which the results are reported. A mere statement of the number of patients operated on, with the proportion of recoveries and deaths, is absolutely valueless, and is often misleading. For comparison between these results and those of modern lithotrity see previous Lecture, p. 93, where in 112 cases of male *adults* (children being entirely excluded), with a mean age of 62½ years, there were only 3 fatal cases, or a *mortality of 2¾ per cent.*

fore somewhat hazardous for large stones, while it is quite unnecessary for small ones.

I now come to the mode of performing the lateral operation; that method which after all, is most trusted and most practised by the surgeons of Europe and America at the present day. As I have said before, when we have to do with many details, let us try to revert to first principles, and define clearly the object we aim at.

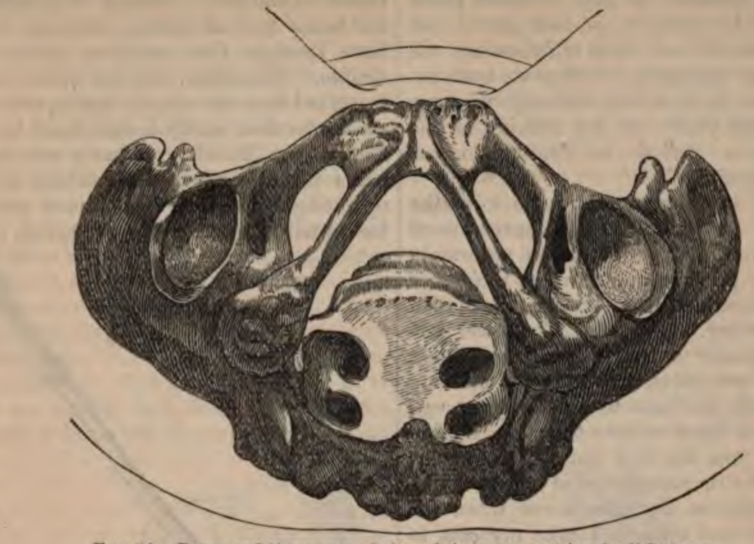

FIG. 54.—Bones and ligaments of the pelvis in the position for lithotomy.

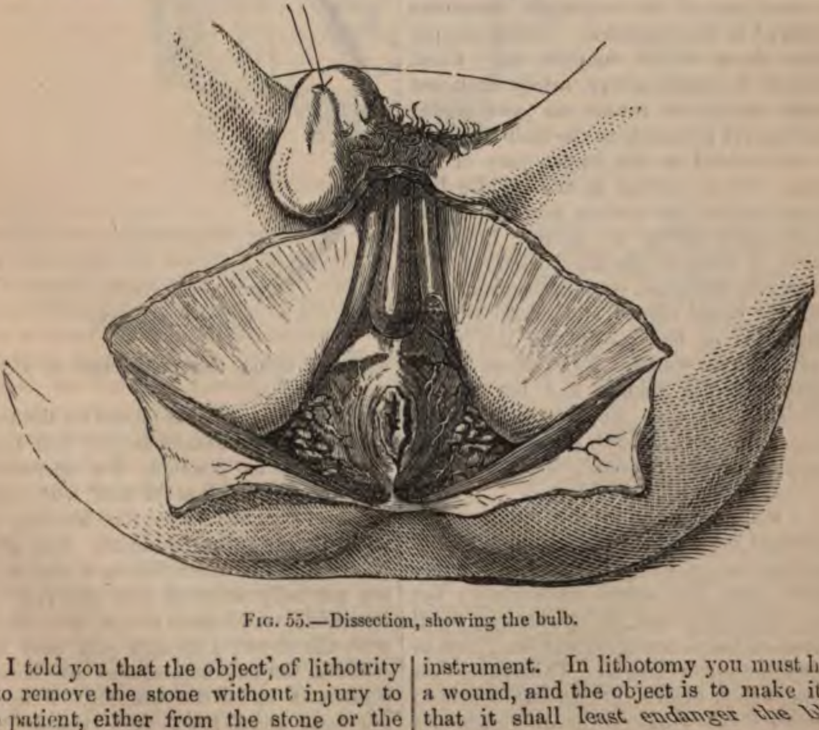

FIG. 55.—Dissection, showing the bulb.

I told you that the object of lithotrity is to remove the stone without injury to the patient, either from the stone or the instrument. In lithotomy you must have a wound, and the object is to make it so that it shall least endanger the blood-vessels, the rectum, and the neck of the bladder; next to remove the stone through the opening thus made with as little mischief as possible to any of those parts. When that problem is best solved, we shall have the best form of lithotomy. It is open to discussion whether we have yet found out the best way, although we have been 2500 years—to say nothing of the pre-historic period—in coming to our present position.

Now, in order to aid you to solve the problem for yourselves, I have placed before you a diagram drawn accurately from the preparation, showing the bones and ligaments of the pelvis, in the position for lithotomy. (Fig 54.) The lower outlet is opposite to us; it is in the patient filled by soft parts, and it is the opening into which you have to cut, and through which you must remove the stone, and in all that you do, you must of course be limited by its boundaries of bone. I like to have that in my mind's eye when the patient is tied up and I take my seat to operate. Here also is a diagram showing the deep dissection of the soft parts which fill the opening or space. (Fig. 55.) But I take it for granted that you know your anatomy too well to require any detailed account here of the important structures involved in the operation. I shall simply name those which concern us. First, there is the pudic artery, safely sheltered under the pubic ramus on your right; but it gives a branch to the bulb, a vessel to be avoided at the upper part of the space. Then vertical in the middle line is the bulb of the urethra, which is not to be thought lightly of; indeed, it is the source of some of the chief dangers; it is a vascular structure, communicating freely with the vessel named, and a deep incision into it is as bad as cutting the vessel itself, if not worse. Next, there is the rectum in the middle and lower part, which it is also important to avoid. Deeper in just below the bulb is the situation of the prostate, which must be divided in the deep incision.

I will now very briefly touch on the principal steps of the operation. A mild aperient has probably been taken the day before, and has acted moderately; but two hours previous to operating a small enema of warm water should be given to empty the lower bowel. Take care that it has acted, before the patient comes to the table, where I have seen the result take place to the annoyance and sometimes embarrassment of those concerned. As to the state of the bladder, you need be under no concern; nothing is gained by its being full of urine, although some have thought this condition highly desirable. Cheselden, on the other hand, preferred it to be empty, saying that the stone was then easily found close to the neck of the bladder. I have seen great pains taken to inject the bladder before operating: but the unconscious patient has usually succeeded in emptying it, in spite of tying the penis, and of similar precautions.

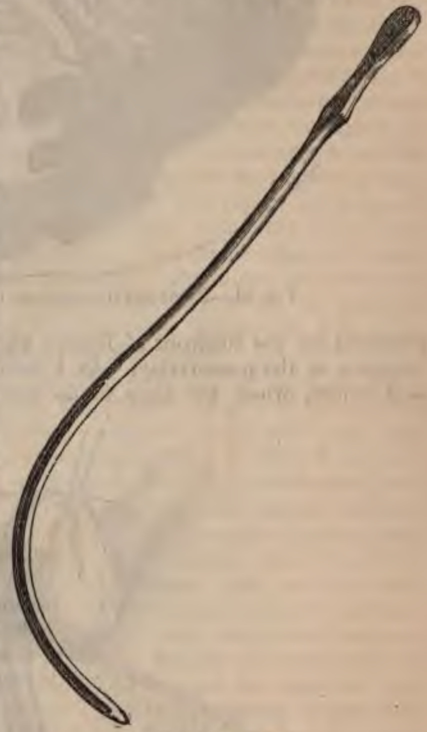

FIG. 56.—The staff.

The patient being placed on the table, ether is to be administered; but before tying him in position, the operator is first to pass a full-sized staff with a deep groove (Fig. 56), into the bladder, and with it carefully to strike the stone. Never think of operating on a man if you are not fully satisfied that the very staff on which you propose to cut, is in contact with the stone; although you may have sounded the day before, and are morally certain it is in the bladder. Frightful blunders have been made through indifference to this rule. Suppose, for example, the staff has passed into a false passage, and is not in the bladder at all; one shudders at the idea of an operation performed on it when so placed; yet these are conditions which must sometimes be encountered, unless the rule laid down is rigidly adhered to. Such a result is distressing to all concerned, calamitous to the operator, and probably fatal to the patient. A distinctly audible note of contact between the stone and the staff is to be clear to yourself, and to one witness at least; and then the staff itself is to be entrusted to the hand of your best friend, who is to attend implicitly to your instructions, and to no others, whatever they may be. The patient is then to be tied up firmly, each hand to the corresponding foot; but this is better done by the leather anklets and wristbands, devised by Mr. Prichard, of Bristol, because they truly realise the proverb, 'fast bind, safe find,' which our old friends the garters often did not. (Fig. 57.)

Now, what are the instructions to your friend, the staff-holder? You want it held firmly, and, of all things, not to leave the bladder. I don't think you will gain much by cultivating a fancy for any particular spot, such as right or left, or projecting in the perineum. If it is to be steady, always in one place, which is the main thing, there must be a point of support for it to rest against, and there is but one such spot in the whole region. Rely upon it, then, you had better tell him to keep it close to the arch of the pubes, well hooked up, with the handle pretty nearly vertical. And he is to be mindful not to depress the handle so as to carry the point of the staff up to the top of an empty bladder, or through it, as I have known thus to be done! Now take your seat at an easy distance, facing the perineum of the patient, whose buttocks should be brought forward until they slightly overlap the margin of the table; an assistant holding a foot and knee on either side, and taking care that they are symmetrically placed and range in one plane before the operator. This done, your arm, when extended horizontally, should be on a level with the upper part of the perineum, which region you are to traverse with the fingers of both hands, finding the lines of the rami; then introduce the left index into the rectum to verify the condition of the bowel, whether it is empty or the reverse, noting also the size and situation of the prostate.

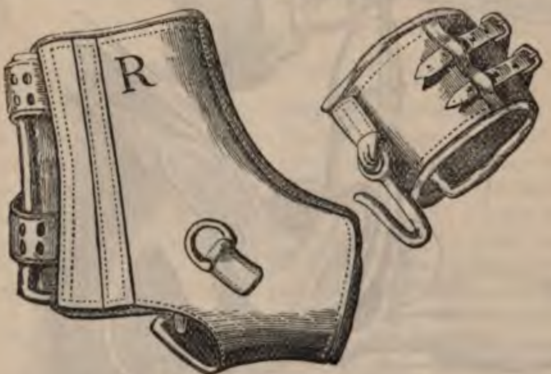

FIG. 57.—Lithotomy anklet and wrist-piece.

Now, relative to the first incision, different authorities advise different places at which to enter the scalpel and commence it. Without discussing these, let me say that, as a rule, the usual point should be, for an adult, about an inch and a half in front of the anus, a third of an inch to the left side of the raphé. Having placed the fingers of the left hand on the upper part and right side (patient's right) of the perineum to steady the skin, enter the knife boldly, in a straight line, pointing neither upwards nor downwards, aiming at and approaching the staff, and cut less deeply as you descend, emerging about two and a half inches lower down towards the margin of the tuber ischii. You may sometimes even touch the staff in that first incision, although this is by no means necessary; but it saves some trouble and uncertainty to appro nearly, which you should always do; for a timid shallow cut which merely divides the skin leaves a young operator sometimes uncertain as to his route to the staff. Then introduce the left index finger into the wound, and separate the cellular connections, when the staff should be felt; and a touch or two with the point of the knife should bring your finger almost or quite into contact. Fix your finger-nail on the inner edge of the groove tolerably far back, so as to avoid the bulb as much as possible; and at the same time guard the rectum with the body of the finger. Slide the point of the knife along your nail into the groove, and enter it firmly, feeling that you divide the tissues and have unmistakable contact between the point and the metal of the staff (Fig. 58). Then run the point firmly and steadily on in contact with the staff, so as to divide a portion of the prostate. Keep the point up, and always in the groove, and you will be safe; let it down, and you may slip out and get it into the rectum, or nobody knows where. Simply go on, letting the blade be more horizontal as it proceeds until the point has just entered the bladder, still not letting the knife leave the staff. The depth of the incision will depend upon the angle which the knife makes with the *staff as it passes* through the prostate: if *the knife is maintained close to* or parallel with the staff, of course you will only make a wound the width of the knife; but if the angle between it and the staff is increased, the width of the incision will be increased also. Finally, withdraw the knife without adding to the wound, unless you see reason to do so, in which case, if the edge is directed outwards and downwards against the soft parts, with a light hand, as you come out, you will make a freer and cleaner opening. It is better to be rather free in cutting than

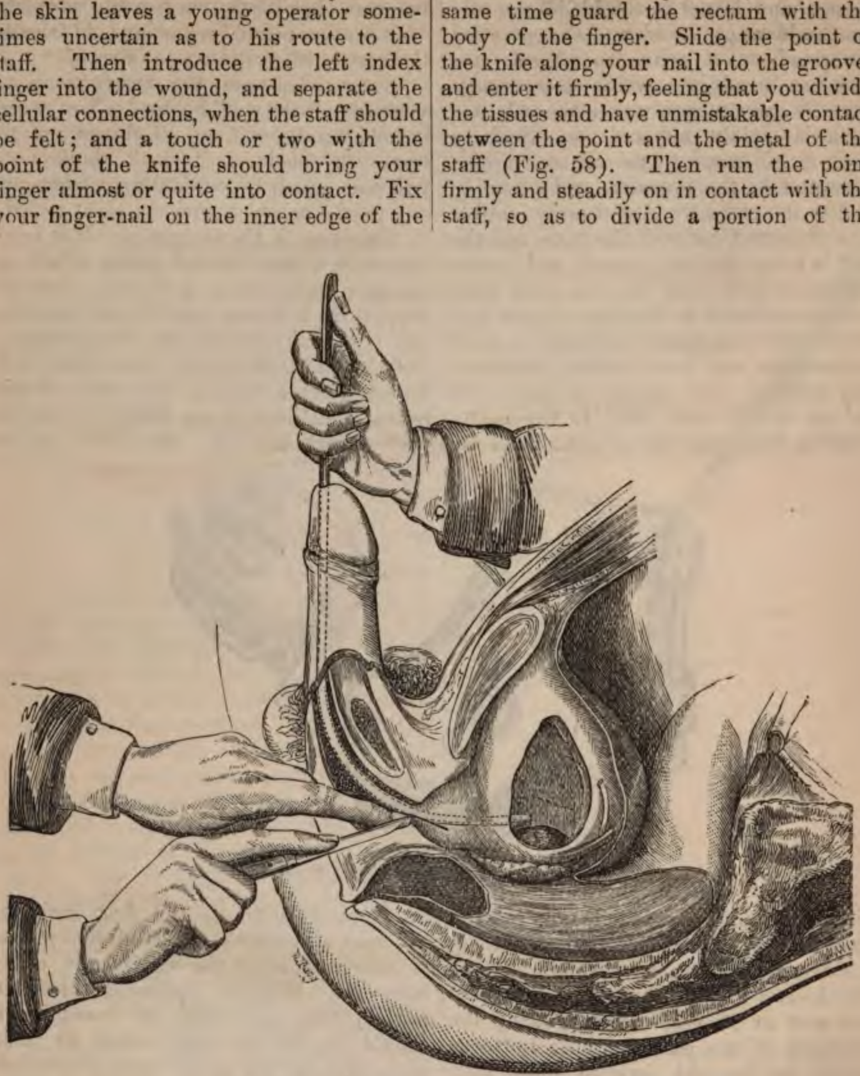

Fig. 58.—The incision through the prostate.

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otherwise [the presence of a large stone is assumed], but you must not make the incision too wide.

There has been a great deal of good advice expended upon this subject—the extent of the deep incision—but it is manifestly impossible for one man to make another understand exactly what he means or what he does by any amount of talk. My belief is, however, that the result of our anxious care about this matter is, practically, that we are apt to cut rather too little than too much, and that the neck of the bladder, in consequence, receives severer injury from the stone and forceps when the wound is narrow, than would be the case were the prostate freely divided by the knife. This observation relates, of course, to adults; for in children you can scarcely find the prostate—it weighs but a few grains, and does not require a moment's consideration, in regard to incision, for the knife goes beyond its limits; yet these little patients are the safest to cut. Of course there is an essential difference in susceptibility to danger at the two ages, due to the widely differing conditions of puberty and childhood.

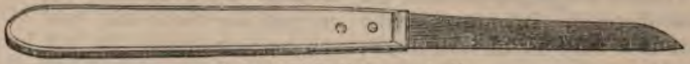

FIG. 59.—The lithotomy knife.

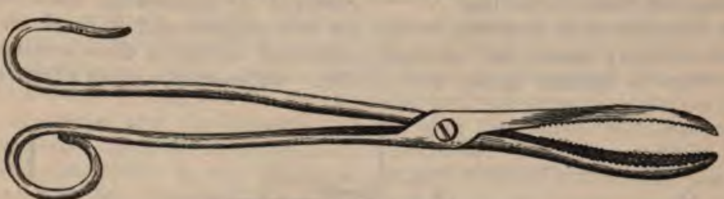

FIG. 60.—The lithotomy forceps.

To return. The incision being completed, your left index finger immediately follows close along the staff into the bladder, where you will probably just touch the stone. Order then your assistant to withdraw the staff. The finger goes firmly and deeply in, stopping the urine perhaps, to some extent in its outflow, and accomplishes the first dilatation of the parts. Then you slide the forceps closely along the palmar surface of the finger, and insinuate them over it into the bladder, which makes dilatation number two. Then taking lightly and delicately one handle in either hand, you have, as a rule, but to open the instrument carefully, yet widely, one blade flat at the bottom of the bladder, the other towards the top, on closing the blades, to find the stone between them. If it seems that you have a good hold, draw gradually outwards and downwards, easing or adjusting, if you can, with the left index, so that the long axis of the stone may correspond with the long axis of the blades, which it is by no means always possible to accomplish; and so you make the third and last dilatation. Remember that you are not to pull out horizontally and bruise the soft parts against the pubic arch, but downwards into the widest part of the lower pelvic aperture. And don't be hurried for the sake of anybody else in order to make a rapid operation. You and your patient are to be, for you, at this moment, the only persons present, and your responsibility to him must never be forgotten for an instant through any influence of bystanders and lookers-on.

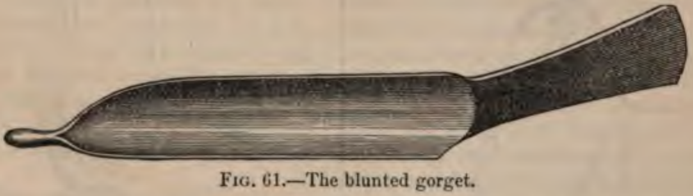

FIG. 61.—The blunted gorget.

But I sometimes meet with a very stout patient, or one who has a very large prostate, and the consequence is that my finger will not reach and enter the neck of the bladder; in this condition, after making the deep incision, I pass carefully along the groove of the staff, the blunted gorget (Fig. 61), the narrower side towards the staff, until it enters the bladder, and on this I slide in the forceps, directing the staff to be withdrawn. Feeling my forceps free within the cavity of the bladder, I remove the gorget and seek the stone as just directed. In rare cases the gorget is thus a very useful instrument, but it should not have a cutting edge; a thin edge, but blunt, is the best.

Your next duty is to introduce by the wound an ordinary sound, and ascertain whether there is another stone; but if any considerable vessel is spouting within view, it is, of course, first to be tied. Severe hæmorrhage always demands instant attention; it is sometimes considerable, and no pains should be spared to arrest it by the ligature if possible. Sometimes the point of a well-curved tenaculum may be carried under an arterial jet high up, which you have failed to tie. Pulling the instrument gently towards you, a ligature may be made to encircle the tissue laid hold of, and then the tenaculum may be left in place. I have one from which the handle may be removed by unscrewing, made expressly for this purpose, and it has been a very useful aid on two or three occasions (Fig. 62). Subsequently inject a large syringeful or two of cold water through a long bulbous-ended tube into the bladder, from which it returns in a current; and place a gum-elastic tube in the wound if the oozing of blood is rather free. The tube is provided with a kind of 'petticoat' of thin cotton material round it, into which you can tightly squeeze some *strips of lint,* and so make pressure on *the bleeding surface (Fig. 63).* The tube may be removed in forty-eight hours or so, taking out first the lint, little by little, and finally the tube itself. If there is only slight bleeding, I prefer to have no foreign body in the wound, and no dress-

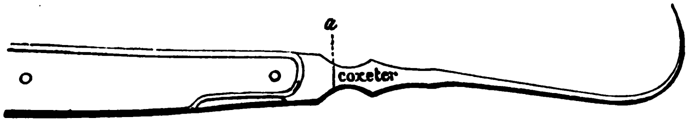

FIG. 62.—The tenaculum, which unscrews near the handle.

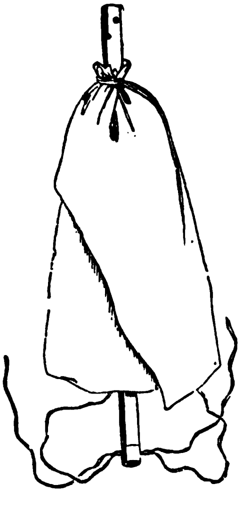

FIG. 63.—The tube, with 'petticoat.'

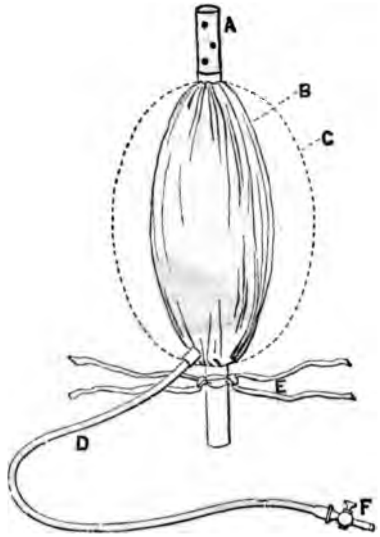

FIG. 64.—The Air Tampon.
A, The tube.
B, Thin india-rubber bag, undistended.
C, Line indicating form of bag when distended by air.
D, Flexible tube, with stopcock for inflating bag.
E, Tapes to fasten tube in place.

ing of any kind. But the most certain mode of dealing with severe bleeding, the ligature failing or being insufficient, is the addition of an inflatable thin india-rubber bag to the tube, so arranged around it that, while its draining action is left intact, the bag can be distended with air, through a small flexible tube provided with a stop-cock. (*See* Fig. 64). It should be introduced so far that the whole cut surface is exposed to the action of the bag; indeed, the further end of this should just protrude slightly into the bladder itself. This done, and inflation being made, the distended bag produces pressure on every portion of the wound's surface, closing every inequality, and effectually stopping all the hæmorrhage. After twelve or twenty-four hours or so, a little air is allowed to escape and the pressure is gradually relaxed, until the apparatus can be removed altogether. It was designed by my assistant, Mr. Buckston Browne, and is known as the 'dilatable air tampon.' It is, in my opinion, the most efficient means we have to control bleeding after lithotomy of any kind: no one certainly ought to perform that operation without one of these instruments at his side.

This matter settled, the patient should be carefully carried from the table to his bed, placed on his back, with one or two pillows under each ham, and the parts involved exposed to air and light, so that you can see how the urine flows. The less meddling afterwards generally the better. The severe pain which is usually felt for a few hours after should be mitigated with full doses of morphia or opium. I have sometimes put a suppository, containing one grain of the former, into the bowel of an adult patient before he leaves the operating table.

I have only time to say a word or two about the median and medio-bilateral operations. For the median an incision is made in the line of the raphé from about two inches and a half above the anus, downwards as near to its margin as is safe, for you want all the space you can get. Dissect down to the staff, with a finger in the rectum, which enables you to avoid it, and take care also to incise the bulb of the corpus spongiosum as little as possible. Then open the urethra with a long straight pointed bistoury in the membranous portion or thereabout, and carry a director on into the bladder; your finger follows and dilates, and then the forceps is to be introduced on that. The operation is more generally performed by thrusting the straight bistoury, with its back downwards, in front of the anus, into the staff, and cutting upwards and outwards at one incision. I prefer the other mode. Manifestly this operation will not do for very large stones, which mainly, thanks to lithotrity, are those which only have to be provided for by lithotomy. Hence the applicability of the 'median' may be somewhat extended, by making it 'medio-bilateral,' and in this manner: Having performed the median, as just described, up to the point of opening the urethra, instead of introducing a director, you introduce the two-bladed lithotome, and when it is in the bladder you open the blades, and two moderate incisions are made, one right, the other left, as you draw the opened instrument outwards in the groove of the staff. A larger opening is, of course, insured in this manner than by the simple longitudinal incision, and a somewhat larger stone can thus be removed.

These two operations I have performed about thirty times, and I do not know that there is any reason for preferring them to the 'lateral.' To make an accurate estimate, at least 100 cases of each operation by the same hand are required. Nevertheless, I may say a word on the principle which essentially distinguishes these operations. They owe their existence to the result of opposite convictions respecting the hazard of the knife. There is a set of men to whom anatomy is a bugbear, and who are afraid of cutting as much as is absolutely necessary; and there are other men less fearful—mind, I don't say less cautious—who regard the larger and freer style of operating as better than the small or timid style. All surgeons, of course, tend more or less to fall into one of these two classes. The anatomical school have devised a variety of median operations in order to avoid certain blood-vessels, &c., and they sacrifice space in doing so. They answer exceedingly well for small and medium-sized stones; but these are, or should be, removed by crushing now, and we do not want any cutting operation for such stones. The perineal operation which offers the most room, the recto-vesical excepted, is the lateral operation. All the others named are essentially median operations. No

I am bound to say that formerly, judging theoretically, I had a leaning to median methods, being disposed to think that they would be attended with less hæmorrhage than the others. But I do not find this so in practice, and I have arrived at the conclusion that there is quite as much bleeding in median as in lateral operations. I attribute this to incision of the bulb, which I regard as a large artery to all intents and purposes. You cut into that spongy tissue—not in all cases, but in some—and there is as much bleeding as if you had cut the artery of the bulb, and there is more difficulty in controlling the flow. The bulb is likely to be cut more or less in the median operation. The problem is how to reach the bladder without wounding the bulb, its artery, and the rectum; and I believe that a well-performed lateral operation more nearly attains that object, where a free opening for a large stone is required, than any other.

I cannot tell you which of these two operations is the easier of performance; if anything, perhaps, the lateral. But here is the important fact, which is only beginning to be realised by the profession —viz., that the exceptional cases of very large stone in the adult alone require any cutting operation, since all the small and middle-sized and even large ones can be much more safely removed by the crushing process. And it is this fact, the demonstration of which is of comparatively recent date, that is bringing these various forms of lithotomy under the serious consideration of surgeons at the present day from a new and different point of view.

The operation of lateral lithotomy is less easy of performance for children than for adults: on the other hand, it is very rarely fatal, and these small patients usually recover rapidly. It is more difficult because the staff must be small, especially for a boy of two or three years; the tissues are soft and delicate, and the outlet of the pelvis is very limited in size.

The points to be attended to are as follows:—First, let your knife, the blade of which must be narrow in proportion to the size of the patient, have a keen point and edge; a blunt knife will push its way without accurately dividing the tissues before it, which it is essential that *it should do. Secondly, having* made an opening into the urethra, and assured yourself that the staff is well exposed, place the point of a small and somewhat tapering gorget clearly in the groove of the staff and push it along the groove into the bladder. If you attempt to use your left index finger for this purpose, as in the operation on the adult, you may, instead of entering the urethra, push before you the prostate and bladder *en masse*, separating them from the urethra, into which the point of your finger is too large and blunt to be easily insinuated. Such an occurrence is highly dangerous, and may prevent your reaching and extracting the stone. Having then safely introduced the gorget, let the staff be withdrawn, and on the gorget introduce a pair of small forceps, rather upwards behind the pubic symphysis, remembering that the child's bladder lies more in that direction than the bladder of the adult does. Take care to remember also how small the space and distance are in which you have to work. The division of the prostate gland is not a matter of concern; it is so rudimentary in children that the incision necessarily passes beyond its limits, and in doing so produces no evil result. No tube is required in the wound afterwards.

The median operation may be employed for children also, and is to be performed with the gorget in the same way. I have done both, and have very little preference for one over the other.

In the preliminary sounding of a child, be perfectly certain, and let a professional friend be satisfied too, that a stone is present before you decide on operating. It is not difficult to strike the wall of the pelvis from the interior of a child's bladder, and to produce an audible note—such has often been mistaken for calculus. It has happened by no means unfrequently that a child has been cut for stone, and none has been found when the bladder has been explored.

In cases of calculus in the female, it is very rarely necessary to use the knife. Up to the size of a large walnut, a uric-acid stone—any other variety is rare in the female—may be crushed, the débris being removed by the aspirator at one sitting. If of the size of a large bean or nut, it may be withdrawn by careful traction, by means of a small forceps or flat-bladed lithotrite, without injuring the urethra. But the withdrawal of a rather large stone entire, by this method, is more likely to produce incontinence of urine than when a moderate incision of the urethra is made. If the stone is larger than a chestnut, say of a flat oval form, the long diameter of which measures two inches or more, I have hitherto always made a lateral incision from the urethra outwards to my right on a grooved staff, and to the depth of half or three-quarters of an inch, and removed the stone with a lithotomy forceps. I have then put two carefully adapted sutures deeply through the margins of the incision, and placed in the urethra a large gum-elastic catheter, about five or six inches long, so that all the urine may drain away continually for three, four, or five days. It is the business of a watchful nurse to see that the catheter is not blocked up, and that there is always a free passage through it. You may reckon, then, on avoiding permanent incontinence afterwards in most cases. Sometimes the retaining power of the bladder is somewhat impaired for a few months after the removal of a large stone by any method, and this is almost the only untoward result to be anticipated. I have lost only one case, among many, of operations for stone on women, and in that case it occurred from pyæmia. But I do not doubt that a stone of the size described above, would now be most safely dealt with by a powerful lithotrite and the aspirator, which we have learned to use so successfully in the male subject.

LECTURE XVI.

ON THE INFLUENCE OF RENAL DISEASE ON THE CHOICE OF OPERATION FOR STONE IN THE BLADDER.

GENTLEMEN,—During the last ten weeks of the year 1872 eight cases of stone in the bladder were admitted to my wards. Of these, seven were adults, chiefly of advanced age; lithotrity was performed for all, and each patient has been discharged cured. The eighth case was that of a lad aged ten years; for him I performed lithotomy, and he also went out well. Towards the end of January, 1873, I returned to my duties here, and found a case just admitted, which possesses characters of considerable interest. I propose therefore to make it the subject of this lecture.

The man was sixty years of age. His first calculous symptoms appeared nearly three years ago. He was admitted to a hospital last summer with a rather large phosphatic stone, for which lithotrity was performed. He left relieved, but passed portions of phosphatic matter occasionally, obliging him to use a catheter sometimes to remove them. His bladder was in that condition in which phosphates are rapidly formed.

Present state (Jan. 24).—Passing urine every half-hour day and night, with much straining and great pain: compelled always to leave his bed for the purpose. Urine pale, turbid, alkaline; specific gravity 1009; a granular cast found at first examination. General condition extremely feeble.

You will remember that I made long clinical remarks in the ward, stating that the patient was the subject of chronic renal disease, discussing the influence this condition must have on the course to be pursued, were there still a stone in the bladder; and that I should make a careful attempt to remove any fragment or phosphatic matter which might be the cause of his sufferings. I did so, taking away a small quantity of this without difficulty. On Jan. 26th he had passed a little débris, and the intervals of micturition were prolonged. On the 28th I removed one very small piece. On the 31st I made another short examination, discovering nothing. That very afternoon, contrary to orders and in the absence of the nurse, he went out of doors into the cold air in the yard. On February 2nd he had a rigor, temperature rising to 103°. On the 3rd another. On the 4th he was drowsy and incoherent. I ordered hot linseed poultices sprinkled with mustard to be applied frequently to the loins. Pulse was about 100; temperature 100°;

urine but little diminished in quantity. This condition continued about two days, when he was much less sleepy, his intelligence returned, the tongue (which had been loaded) began to clean, and he took food very fairly. We had quite given him up, as you know, on the 4th, and now began to hope he would rally for a time. But on the 8th and 9th he was not so well; the urine acquired a marked blood-tint. Hot poultices to the loins were followed by manifest improvement on the 11th and 12th. On the 13th the urine was again worse, the patient weaker and indisposed to take food. On the 17th the drowsiness and incoherence reappeared; temperature was below natural; pulse weaker; urine more bloody. He gradually sank, dying in the evening of the 19th.

At the autopsy we found conditions of which the following is a very brief *résumé*:—Bladder thickened; grey discolouration of mucous lining; patches of false membrane adhering. Very marked bar across its neck uniting lateral lobes of prostate; deep pouch behind, containing a few small phosphatic concretions, weighing 12 grains. Ureters somewhat dilated; the left more so than the right. Kidneys surrounded by fat, vascular and indurated, attached to the capsule, which peeled off with renal substance adhering, and opened tiny abscesses. Surface lobulated, minutely granular. Size normal, as if a granular contracted kidney had been temporarily enlarged by inflammatory action. Surface of right greatly congested, hæmorrhage in places; left less so. Cortical portion in both thin; in left particularly so. Section brownish, with small, pale, yellowish spots interspersed; the pyramids intensely congested. The pelves dilated; lining membrane deeply injected throughout. Microscopic sections were made, and on examination the tubules were seen in some parts to be filled with granular epithelium. The Malpighian bodies were surrounded by crowds of young cells resembling corpuscles. On microscopic examination of a section of the kidney hardened in alcohol, the tubules of the cortical part were found to be irregular in size; some dilated, some narrowed. In the dilated tubules the epithelium was granular, the cells being shrunken and atrophied. The epithelium had entirely disappeared in some tubules, and the lumen was filled with granular débris. Between them, in all parts of the kidney, were crowds of young cells. Around the Malpighian bodies these were accumulated five or six deep. In some parts in the immediate neighbourhood of the small abscesses the structure of the kidney was undistinguishable, and its place occupied by masses of young rounded cells.

For this poor fellow the only question to be entertained was how best to relieve or palliate the painful complication of his fatal malady: advanced Bright's disease, the one; diseased bladder, containing phosphatic matter, the other. It was not a question of cure, nor could there be any prospect of it. His stone had been previously removed; but the decomposed urine and mucus together were daily forming phosphatic deposits, which, cohering and drifting into the urethra, occasioned intense pain. Such a subject is only one of several which are naturally suggested by the case before us. I shall, therefore, take the opportunity of discussing briefly a large theme arising out of this, which may be thus stated.

When stone in the bladder coexists with any disease of the kidney, how does this influence the decision in regard to operative proceedings for the former?

1. I must first define what is to be understood here by the term 'disease of the kidney.' It is a comprehensive one, and is apt to be employed somewhat loosely. It embraces, of course, all the morbid affections to which the kidney is liable. These I shall endeavour to classify in a broad and general way; and in doing so will first put aside, as obviously foreign to the subject in relation to operative measures, the malignant diseases of the organ.

(*a*) Those chronic changes in the kidney-structure associated with constitutional cachexia, of which they may be more a local expression than a cause, and which are comprehended under the term 'Bright's disease,' form an important proportion of the maladies in question. In the dead-house you know that we meet with kidneys differing very much in appearance, size, and structural characters, all yet furnishing examples of different kinds of Bright's kidney, or, in some cases, of different stages of the same kind of disease. Most are included under the distinct types of 'the granular contracted kidney,' like that of our patient, and 'the large, smooth, white kidney.' Not to overlook a much more rare condition, I just name the 'lardaceous' or so-called 'amyloid' degeneration. Now, the symptoms which denote Bright's disease are, for the most part, sufficiently clear and distinct during life, as you know; and the amount or stage of disease is, within certain limits, fairly calculable after some knowledge of the patient.

(*b*) Another kind of change which is wholly distinct from the foregoing occurs in kidneys which are either frequently or for a considerable time the seat of calculus.

The presence of minute foreign bodies, for the most part aggregations of uric-acid crystals, in the uriniferous tubes, at their orifices and around them, in the calices, is a cause of injury to the structure affected in a degree corresponding to the duration and the magnitude of the deposited matter. Any degree of injury, from a circumscribed and temporary inflammation of the lining membrane of the pelvis caused by a large quantity of rapidly formed crystals, up to almost entire destruction of the organ from the presence of a large renal calculus, may be observed. Happily, the latter condition is rare. On the other hand, the former is very common. I doubt whether any man passes much concrete uric acid for a few months without some very slight damage to the kidney. Certainly, during the process blood is almost always to be found in the urine by the microscope; and it must be inferred that when the habit of periodically passing uric-acid calculi has existed for some years, a certain degree of permanent deterioration has been suffered by the kidneys. There are no other special signs of this condition. The patient's general health is often very good. There is no cachexia as in the class of diseases (morbus Brightii) just referred to. On the contrary, the patient is often hale and hearty in appearance. The characters of the urine are good; quantity abundant; specific gravity full average; no albumen, but urates often in excess, and blood-discs are present, insufficient to affect the naked-eye tint of the urine. Pain about the renal and sacral regions and the hips is often complained of. But I have frequently remarked to you that such patients sometimes exhibit considerable febrile phenomena on instrumental interference, and that, although they look so well, more than ordinary caution is necessary in dealing with their calculi.

(*c*) I name without further allusion to it here, saccharine diabetes, which cannot be passed over while considering renal diseases. To save returning to the subject, let me say that there is no question that for this and the preceding class, in which patients with vesical calculus are usually elderly, lithotrity is certainly preferable to lithotomy, unless the stone is large. The exercise of caution on the part of the operator to employ instruments as little and as gently as possible is essential. I have operated on two patients with success who were the subjects of marked saccharine diabetes, one of them within the last month; both were very sensitive to mechanical interference. Since this I have operated on two more, in both of whom the diabetes was of long standing: on one by lithotrity, on the other by lithotomy; both patients were seventy years of age, and both died shortly after the operation. I think that advanced diabetes renders the case unusually hazardous in relation to operations for stone: and in all cases occurring in elderly people, of kidneys long troubled by the presence of renal calculi, more or less increased risk is likewise incurred in performing grave operations on the urinary passages.

(*d*) The last class of renal changes which I have to consider are those resulting from diseases which habitually obstruct the outflow of urine. These affections also are not uncommon, and have an intimate relation to our subject.

Many years ago I described the process by which such renal changes occur. The principal conditions which originate them are, stricture of the urethra, enlargement of the prostate, large vesical calculus, and, less commonly, atony of the bladder. The order of enumeration is also the order of numerical frequency as a cause. Stricture always constitutes an obstruction to the outflow of urine commensurate with the degree of the narrowing. Considerable prostatic enlargement is a cause also, but notably less powerful than the preceding. Vesical calculus sometimes acts in the same way, but by no means as a rule; on the contrary, it is an exceptional circumstance when it does so, depending on certain conditions which vary with the individual, such as the habitual position it occupies in the bladder, its size, its liability to roll to the neck, &c.

This, however, is certain, that in cases of long-standing calculus, an autopsy will sometimes show only slight signs of renal changes produced by obstruction, while in another case those changes will be remarkable for their extent and degree. In no instance, be it remarked, do such changes occur apart from obstructed micturition in some form, and always of long standing.

The changes I refer to are dilatation of all the urinary passages behind the point of obstruction. Thus, in stricture of the urethra, we may observe dilatation of the urethra itself and of its glands; protrusion of the mucous lining of the bladder through the interlacing fibres of the muscular coat, producing sacculi; dilatation of the ureters, of the pelvis of the kidney, of the proper renal structure, and thinning by pressure of the renal substance itself; so that the organ has the appearance of a series of cysts, which formerly was really supposed to be its pathological condition. I may refer to a work published in 1854, where the details were given by me with considerable minuteness of the changes which occur through the influence of fluid pressure.[1] Let us consider for a moment the mechanical process by which this remarkable series of changes is effected. You know that hydraulic pressure is equal in every direction. Thus, if I make pressure on a flexible bag filled with fluid, that pressure is exerted equally at every point of the periphery; and if tubes are inserted, say in a vertical position at opposite sides, the fluid will rise and issue with equal force from each. Now, what happens in the flexible bag which constitutes the human bladder when obstruction exists in the form of stricture, enlarged prostate, or calculus? More force than natural is of course exerted to accomplish the act of micturition; the patient 'strains,' as he says, to pass his water, and sometimes, if the obstruction is considerable, the force exerted is very great. You see at once that this tells not only in the anterior direction upon the obstruction itself, but also on the ureters which enter the bladder from the kidney behind. Let us say that the ordinary pressure required to pass water in the healthy organs is one pound to the square inch (one number being, for the sake of illustration, as good as another), when obstruction is present the pressure may certainly be increased, two, three, five times, or more. Further, the act of relieving the bladder, instead of occurring only five times in the twenty-four hours, and being speedily completed, may recur ten or twenty times, and the duration of the act may be greatly increased also. It is not necessary to explain to you how this state of things must act, and how that after a time (for the mouths of the ureters, not being so patent as the inner orifice of the urethra, do not easily yield to pressure) every act of straining tells on the passages, and dilatation advances by degrees until at last even the kidney suffers from the continued pressure and from the inflammatory process which necessarily accompanies it; for the ureters and pelves of the kidney may become supplementary reservoirs to the bladder, and are sometimes found filled with decomposed and ammoniacal urine. Long before this stage arrives inflammatory action invades these parts, a condition recognised, as you know, as pyelitis [diagram of dilated organs made]. By some this condition has been called 'surgical kidney,' a phrase which others have applied to denote the acute suppurative nephritis which sometimes closes the scene for a patient who has long had renal disease. I was glad to find Dr. Dickinson proposing at the Medico-Chirurgical Society to abolish so unphilosophical a term. It is one I never use and have a strong objection to. Why 'surgical' kidney indeed? Certainly in one sense only—namely, that it is for want of surgical aid that the organs have come to the state in which they are. If that aid were rendered early in the history of the case, whether it be stricture or stone, no such condition would ever arise. Never was the proverb truer that 'a stitch in time saves nine'—a surgical stitch, you understand. The pathological condition thus attained might well be termed 'mechanical dilatation' of the ureter and kidney, as being mainly, although not entirely perhaps, produced by the physical process described.

Let me now inquire what are the symptoms which it produces during life? I know of none which are distinct and significant. I made this, I had almost said, humiliating admission, nearly three years ago (1873) at the Medical and Chirurgical Society, laying much stress on the fact for the express purpose of inviting attention to it.[1] I have long sought for some sign that should indicate the presence of extensive pyelitis and dilatation, but in vain. Such a patient presents no sign of change in the urine itself. It is of full specific gravity, abundant in quantity, without albumen, except that which the presence of pus and blood accounts for, and such pus and blood are commonly found as vesical products formed by irritation from the calculus in cases where no renal disease exists. Whenever you have stone of more than small size you may have such products, and we are bound to expect them if the patient has any symptoms of cystitis, and some cystitis is always present in these cases of dilatation. Again, there is nothing which we can identify as disintegrated portions of renal tissue—no casts of tubes, nothing but pus and blood-discs—nothing, in short, distinctive. Then at no stage of the disease is there any dropsical effusion, no habitual dryness of the skin, not necessarily any marked feverish state, constant or intermitting. Nor is there any diminution of weight; on the contrary, the patient may have gradually acquired fat. But he is always, if the condition is advanced, in feeble health, is worn, and easily exhausted—signs which impress you with nothing so much as his obvious inability to bear any severe test of his physical powers, from all of which, however, nothing absolutely diagnostic can be inferred.

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[1] *Stricture of the Urethra*, first edition, pp. 64–70.

But it has been said, and with some plausibility, if the kidney is much damaged by disease, the urine will certainly show a deficiency of urea. Practically that is not so. Practically, with much pyelitis and dilatation, urea is sufficiently eliminated. Two half-kidneys, to speak roughly, will probably do the necessary elimination for the system in circumstances of quiescence, just as two half-lungs may suffice for a patient in very favourable circumstances; and failure to excrete urea is only manifest when the action of those two moieties of kidney is suddenly interfered with, by disturbance from external cold, &c., or by the inflammation propagated by means of an operation on the urethra or bladder. Practically, again, if I examine the urine of a patient in order to determine the amount of urea, and find it manifestly insufficient, is it not the fact that my patient must at that moment be to some extent in a condition of uræmic poisoning, and that he will certainly show some clinical sign thereof? Is not the fact that no such sign is present the only real proof that urea is sufficiently eliminated? Once the urinary constituents begin to be retained in the blood, the moment is at hand when symptoms of poisoning will appear. The chemical test alone must not be relied on in practice. When a patient passes abundance of urine of specific gravity 1018 to 1025, without casts, with no albumen except that which is due to the blood and pus found in the secretion, we have no ground for believing that any advanced organic renal disease exists, unless we obtain evidence of its presence from other sources.

Now, I never operate for stone without first ascertaining whether the condition of the urine is that above described; so that if I undertake an operation for a patient manifestly the subject of renal disease, it is in full view of that fact, and because it may be absolutely necessary that surgical relief must be attempted at all hazards. Of this I have to speak by-and-by. No one would be more ready than myself to obtain further aid from chemical tests. I only fear that none are known which can aid us to demonstrate the presence of the mechanical dilatation to which I have referred.

Again, it has been said, Can you not by palpation or percussion demonstrate the existence of this disease? I answer for myself distinctly 'No.' A foreig authority demanding the utmost respect has recently affirmed that it is possible. With great deference, and after giving much special attention to the matter for some years, I emphasise my dissent on this point. I have long recognised this condition as one of the great stumbling-blocks, perhaps the greatest now existing, in our way to diminish the mortality after operations for vesical calculi of large size. Had I any means of certainly ascertaining that a patient *with such a stone* had ureters and kidneys largely dilated, I would advise him not to submit to any operation, and I would do all I could to prolong his life and make it tolerable—a condition within certain narrow limits to be attained. Something may be done under these circumstances to accomplish this end—more, perhaps, than is often believed, of which I have seen some remarkable instances; but sometimes, it must be confessed, such palliative measures are useless, and the patient demands relief from sufferings which are intolerable, no matter what the risk may be. Can we under such circumstances humanely refuse him?

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[1] Referring to it, I said:—'It must be admitted that at present we have not an unfailing means of ascertaining the existence during life of these conditions. There may be no albumen in the urine, and not necessarily are there any deposits significant of the renal affection. The urine of a calculous patient frequently contains mucus, pus, and blood; but whether the origin of these is in the bladder (naturally its most common source from the irritation of the calculus) or in the organs above, it is impossible always to determine; and usually there are no casts or other pathognomonic signs of disorganising renal structure. In fact, neither physical signs nor subjective symptoms are by any means frequently present, and yet advanced pyelitis, and even sometimes chronic nephritis, may exist. . . . . Could the existence of these conditions be accurately diagnosed beforehand, it might become a question whether the crushing operation, or any operation at all, should be performed. For there is little doubt that the existence of such organic changes is almost as surely a source of fatal issue in lithotomy as in lithotrity. Now, in the twelve cases before us, one or other of these conditions certainly existed in five; and had it been possible to be aware of them the operation might not have been performed, and the patient might have lived a little longer, with much suffering, it is true, and he ultimately must have died at no distant period.' *Royal Medical and Chirurgical Transactions*, vol. liii. pp. 136–7, 1870.

To return, however: let us inquire what we can accomplish by palpation or percussion. First, I have determined the fact beyond all question, that there is by no means necessarily much, if any, tenderness in the regions of the ureter and kidney—that is, acute suppuration, active inflammation, or renal calculus not being present. You are accustomed to see how often I examine those regions in the wards. And you know how efficiently one may do it with a patient who is thin and spare; and also how particularly unsatisfactory is the examination when the patient is corpulent. Now the former condition is one you can by no means always reckon upon; on the contrary, I affirm that the latter condition must be more commonly expected in these cases. For a year or two, perhaps, the patients have been inactive, and fat has accumulated; and then you can learn little about the ureters by palpation. Again, the condition of the organs, even in the spare subject, offers no objective sign to physical examination. Let us suppose a ureter as big as the aorta, or larger still: Is it a tube filled with air like an intestine which will give you a corresponding *note? Is* it filled with fluid, and will it *thus give you a line of dulness* which may be traced? By no means; it is a flaccid sheath with thin yielding walls, transmitting fluid it is true, but you can no more isolate it by percussion from the adjacent structures, so as to demonstrate its size, than you can isolate by a similar process—let me say, the lumbar plexus. Of the kidney itself the same thing must be affirmed. You may, if fairly practised, determine the solid mass of an enlarged kidney; but there is no way of demonstrating the existence of a dilated pelvis or of thinned kidney-structure by any physical examination. No doubt you may guess—shrewdly perhaps sometimes; but it is no place or time for guessing when life or death hangs on the decision. There is a field here for further research; the door is open for investigation. For, you may rely on it, no method of arriving at anything like a certain diagnosis of pyelitis with mechanical distention is at present known.

2. But I have now to consider what influence ascertained disease of the kidney exercises on the prognosis, when the subject of it has also a stone in the bladder, and the question of operating for its removal has to be considered. Let me first say that when the stone is small—the size of a small nut—whatever the condition of the kidneys, there is no very great risk from lithotrity if well performed. But it is by no means always that we are so fortunate as to find the patient with a small stone. It may be large, and do what you will, the patient is in a position of danger; the only question for us is—by what treatment will that danger be least?

I have operated certainly in three cases in which advanced Bright's disease was known to be present, but in which the sufferings of the patient were so great that an operation was most desirable. In each the stone was phosphatic; in the first and second it was large, in the third of medium size.[1]

The first was a gentleman whom I saw with Dr. Sharpe, of Norwood, in 1865. With extreme care I removed the whole in eight sittings, with great relief to the patient. His urine, although fairly clear, was of low specific gravity, and charged with albumen. The subsequent part of his life—I believe about six or nine months—was rendered comparatively comfortable. The second case was in this hospital in 1870. He was also handled with the utmost caution, having five sittings in ten weeks, owing to the severe rigors and prolonged fever which followed some of them; but he went out marvellously improved, and lost all his calculous symptoms. I saw him three months after, and he fully maintained all he had gained. I have heard nothing since.

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[1] By 'medium size' I intend always a stone which measures about an inch as the mean of its two diameters.

The last of the three occurred about the same time, also in the hospital. His disease was more advanced than that of the preceding case. Only on his very urgent solicitation I consented to try lithotrity. I could not resist the appeal to diminish his suffering, if possible; that he must die at no distant time both he and I knew. With his pallor, debility, and uniformly rapid pulse, lithotomy could not be thought of for an instant. I kept him three weeks before touching him, in the hope of improving his condition. Five sittings sufficed to remove nearly all the stone; but the last was followed by severe shivering and vomiting, and death in a few days.

Should I have done lithotomy in any of those cases? I answer unhesitatingly, in not one of them was it possible to submit, with any chance of success, men in such a feeble state to any severe cutting operation. Nothing but lithotrity could offer the slightest chance, and it saved two of them from the anguish of stone, and from the additional proclivity to death which it entailed.

But these, you say, were examples of known 'morbus Brightii,' and you naturally enough demand if I should be guided by the same principle in a case of mechanical dilatation and pyelitis if I knew beforehand that I had to deal with such an one? To this I can only say that the patients whom I have seen, and whose autopsies have demonstrated that they were the subjects of that condition, have been manifestly defective in vital power—patients for whom I should certainly shun a cutting operation of any kind if possible. Although, as I said on another occasion, had we the means of identifying an advanced example, I should gladly avoid either lithotomy or lithotrity, still I believe that I have employed the latter with success for a few. I have thus operated three times in cases of bad old-standing stricture of the urethra (maintaining the urethra well dilated by a catheter permanently tied-in for the purpose, as you have seen), in which I have no doubt that considerable mechanical distention of all the passages existed. But these people were so miserably feeble that nothing would have induced me to cut them, nor do I think that any man would have ventured to do so.

But you might still rejoin, and you would be quite right in doing so, 'surely it has been said by surgeons of experience in the past, that when "renal disease" exists, it is better to remove the stone by one operation, although severe, than to attempt it by a process which requires repeated introductions of a lithotrite, and more or less continued irritation from fragments?' The fitting reply to-day, as it appears to me, is, that although this was undoubtedly true some thirty years ago, it is by no means necessarily true now, when the relative capabilities of the two operations of cutting and crushing have so greatly changed. The operation of lithotomy had arrived at its present perfection before lithotrity was invented. No results more perfect than had been attained by its means have ever been accomplished by it since. On the other hand, the perfecting of lithotrity has been a progressive process from fifty years ago to this very day; and thus it is that the axiom about renal disease, right as it might have been in the past, has been growing less so year by year. *I believe it is reversed for stones which may be easily crushed.* In support of this conviction I have called before you six unimpeachable witnesses—I might easily have called more—six patients who could not have been cut. To have placed those feeble and pallid frames on an operating table for lithotomy would have been to slaughter them outright. Of those six, five were saved. I believe, then, that for any stone of almost any size in a patient of broken health from advanced renal disease, if any chance exists from operation at all, it will be by lithotrity; and that in such a case lithotomy will be surely fatal. The choice in a bad case is lithotrity or palliative treatment; with a very large stone not easily crushed, it is lithotomy or palliative treatment, probably the latter.

But then it is impossible to overlook one condition, and it would be usele affectation to do so. I mean by lithotrity an operation carefully done by an experienced hand. Rather than have it done in any other fashion, let lithotomy be selected by all means. It is impossible to compare these two operations as we do some others—as we can, for example, any two modes of amputating a limb. Nor may we blink the fact that, while the lithotomy practice of one good surgeon may not differ greatly in the long run from that of another, it is impossible to deny that the lithotrity of the two may be wide as the poles asunder in its quality as an operation, and as to the chances which it may offer to a patient. Thus it is that a bold, well-performed lateral lithotomy is quite possible to the young surgeon at the outset of his career, while nothing but considerable experience can make him a good lithotritist. The two operations can never be compared, nor their capabilities estimated, without keeping in view this fact. You whom I address had better, when in practice in the country, decide in difficult or doubtful circumstances to cut rather than to crush, until you have acquired some facility in the practice of the latter art, unless, indeed, the stone be quite small. Do not touch with the lithotrite in any circumstances a stone which is decidedly large until you have had experience with a small one or two.

Gentlemen, one great practical point remains, always recurs, and at last comes uppermost, on whatever side the great subject is considered. It is this:—Detect the existence of a stone in the bladder early; it is always somebody's fault if not found early. The stone will then be small. It may be crushed at a short single sitting, and with almost no risk. No question of cutting need ever arise; the presence of kidney disease need scarcely trouble you. I have never lost a patient after lithotrity, when the stone was small; nor in such circumstances do I expect ever to lose one.

[This Lecture related to the case of the Emperor Napoleon III.; a patient in the hospital at that time (Jan. 1873) furnishing the theme.]

LECTURE XVII.

EARLY HISTORY OF CALCULOUS DISEASE, AND THE TREATMENT BEST ADAPTED FOR ITS PREVENTION.

GENTLEMEN,—We have recently studied together and discussed very fully the various operations which are practised for the removal of stone from the bladder, and you have had the opportunity of seeing them performed many times, not less than eleven cases having passed through my wards during the last few weeks, each one with a successful result.

But, satisfactory as such a result is, it suggests very strongly to my mind that there still remains an important question for us to consider; as important, indeed, as any of the preceding subjects, and one which must naturally arise in all thinking minds. The question is this: Is there not a period anterior to the stage of the malady already examined—a time at which we might prevent the formation of stone in the bladder, and so get rid of the necessity for mechanically removing it? Admirable as the results of operative means have been—perfect (one may almost say) as they have become, at all events so far as regards the crushing operation—great as is the triumph which surgery has achieved in the art of removing stone from the bladder—I take it there are very few men who would desire, if they could help it, to exhibit that triumph in their own persons; and who would not be infinitely better satisfied if we were able to prevent the formation of stone, and not merely to accomplish its removal, however satisfactorily the operation for that purpose might be performed. This, then, leads me to the consideration of an important inquiry—Can we do anything to prevent the formation of stone in the urinary passages? It is, in fact, the earliest stage of this malady that will be the subject of our lecture to-day.

I commence by saying that I think a great deal may be done. But at the outset of the inquiry we naturally ask, What is the kind of stone (for there are several kinds) the formation of which we may hope to do most in preventing? All calculi are either of local or of constitutional origin. By 'local,' I mean formed by disease in the bladder itself, and not depending upon any constitutional conditions; by 'constitutional,' I mean formed by some vicious action, some error of assimilation inherent in the system. Now, the large majority of stones are of constitutional, and not of local origin. When they are local, you know that we cannot prevent their formation except by mechanical means. Calculous matter, the elements of which are produced in the bladder, may be washed out, or be broken or dissolved, and then washed out. But when stones are of constitutional origin—and we are going to refer entirely to these to-day—their component elements are separated from the blood, and no mechanical mode of preventing their production can by any possibility be available.

Now, from observation, we know that nineteen out of twenty of such stones have uric acid for their basis, the remaining one in twenty being oxalate of lime;[1] and, less commonly still, there are phosphatic stones which are of constitutional origin also. Therefore, practically, to all intents and purposes, the problem before us is contained in the question:—How may we best prevent the formation of uric-acid calculus.

Let us examine the early history of a case of persisting uric-acid deposit. First of all, let me say, going back to the root of the matter, that this marked tendency is generally more or less hereditary. As an illustration on the spot, let me recall the man we have just seen with uric-acid calculus in the ward, of whom we learned that his father had 'gravel or stone for the last twenty years of his life.' And a very common experience it is, that either calculus or gout—more commonly the latter—has been observed in the family of the patient who comes to me with one of these formations in his bladder. I believe it, then, to be strongly hereditary. We speak of tubercular disease and of cancer as being transmitted by blood relationship, especially the former; but I doubt if it is so certainly hereditary as the disposition to uric-acid deposits in one form or another. I make a point of asking the question of all patients who come to me with this complaint; and although I cannot at present furnish you with an exact numerical statement, I do know that in a large majority either gravel or gout (for I wish to show you the identity as to origin of these two complaints) has existed in the preceding generation; indeed, it is not common to find it otherwise. This hereditary tendency varies in force or strength in different families. You will find some persons with persisting uric-acid deposits at thirty years of age or sooner, others at forty, others at sixty. Of course, the earlier the time at which it appears, the stronger you will infer the hereditary disposition to be, and the more obstinate, probably, will be its tendency to persist.

What, then, are the first signs of this condition in the patient? Usually, the first sign is that the urine deposits pinkish matter, on cooling, at the bottom of the vessel, or that the secretion has merely become cloudy when cold. Sometimes, too, a delicate film or pellicle covers the surface, which faintly exhibits the prismatic colours. The urine has been passed originally quite clear, becoming cloudy only when it has acquired the surrounding temperature. This phenomenon, therefore, may appear more frequently in winter than in summer, because the external temperature is lower. It is simply a deposit of salts from a hot solution, as the liquid cools; the deposit being easily dissolved by raising the temperature of the liquid to that at which it was originally passed. The condition of urine here described, very often and very unnecessarily excites much anxiety on the part of the patients; but only a persisting condition of it can be regarded as a sign of what is called 'the uric-acid diathesis.' Mind, I mean strictly persistence, or at all events frequency of occurrence: for you or I, with no hereditary predisposition, may take a little more beer, or a heavier dinner, than usual, or an extra glass of champagne, or a glass or two of extraordinary port, and may find next morning a considerable quantity of this pinkish deposit, the urine looking almost like pea-soup, but not so thick, or like a mixture of rhubarb and magnesia; and when the vessel is tilted on one side, a tidal mark, so to speak, is seen, showing the height at which the liquid stood; all this, as I said before, being redissolved by heat. The opacity of the liquid, as well as its tint, which may vary from fawn to dull red, are due to the unduly large production of the mixed urates; that is, urates of soda, potash, lime, &c. But if, without any errors of diet, among which, any but a very small allowance of alcoholic drink is only one, a patient habitually passes this kind of urine—if in time there frequently arrives also a deposit of uric acid, manifested by the presence of little crystals, looking like particles of cayenne pepper, at the bottom of the vessel—when this occurs rather early in life, say before forty, we cannot doubt that there is a strong tendency to produce uric acid, either inherited or acquired. For this tendency may to a certain extent be acquired, or a pre-existing habit may be intensified; but, as I have before said, it is mostly inherited. I now show you a specimen of urine quite cloudy with mixed urates, although you must be familiar with it in the wards, and also with the fact that on heating the liquid it again becomes clear, and that in a short time, while we are talking, it again becomes cloudy on cooling. Let me once more remind you that this may happen with the most healthy individual; and it is only the persistence of the symptom, without errors of diet, which should lead you to suspect a constant condition that requires treatment.

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[1] The deposits of oxalate of lime and of uric acid so often replace each other that the consideration of the latter becomes practically generally sufficient for our purpose.

We have followed the complaint up to the formation of cayenne-pepper crystals. Of this deposit I have some very good specimens here, which have been collected from patients who passed it habitually. These consist mainly of the transparent rhomboidal uric-acid crystals—which you know to be very beautiful objects under the microscope. They may be passed almost daily and habitually by some persons, and without any sense of discomfort, or occasion for complaining. Other persons may pass this material periodically in large quantity, little or none of the deposit being observed during the interval. At such periods, the patient often experiences pain in the back, or over one hip, with uneasiness extending to the groin and testicle, all this perhaps accompanied by sickness or nausea; and he may then be said to have an attack of sand or gravel. He feels relieved after the occurrence, which, just as a storm is *said to clear the air,* has freed him from an *accumulation in the system.* I have satisfied myself that many patients who have had symptoms commonly denoting the passage of renal calculus, have been merely the subjects of a 'uric-acid storm,' if I may use the expression; and that much calculous matter has been eliminated in a soluble condition, not necessarily always in the concrete form of gravel, although the process has been accompanied by pains sufficiently severe to arouse the suspicion that a calculus has been passed. These phenomena occur at varying intervals, and usually become more frequent or severe, unless the patient does something to prevent their occurrence. Subsequently, he may pass tiny calculi, rightly termed gravel, which seem to be rounded or irregular aggregations of the same crystals; and these little bodies tend in time to become larger, sometimes as large as small peas, or even beans; and they are still specimens of the same product—that is, of uric acid, associated more or less with some alkaline base, such as those above named. These attacks are usually accompanied by excruciating pain in the regions already mentioned, and by severe vomiting, lasting a few hours; after which relief often occurs somewhat suddenly. The urine is at times scanty, and at times deposits blood in that dark form which is described as resembling 'coffee grounds.'

Here, let me recall for one moment what I said as to the relation between gout and uric-acid deposit. I have sometimes seen these two complaints alternating, comparing one generation with another; gout appearing in the one, gravel in the second, and then gout in the third. But the same individual may also have alternating attacks of gout and gravel. I have seen a patient suffering for years from gout, which ceased for several months, when he developed for the first time a uric-acid stone in the bladder. Lastly, the so-called 'chalk-stones,' which you have often seen infesting the knuckles and disfiguring the hands of elderly people in advanced stages of gout, are composed of the same material—that is, of uric acid, usually as urate of soda. The identity of the two things, then, is unquestionable; they constitute two different series of phenomena, but both spring from one and the same root.

Now, what is to be done for these cases? What mode of treatment will help to prevent the arrival of at least the advanced condition—namely, that of calculus too large to be voided by the patient? Generally speaking, I think such patients come under observation in a tolerably early stage, although this is by no means always the case. Some are much alarmed at a very early period, when the urine is only occasionally thick with urates. You will of course disabuse such patients of their false impressions, because numbers of persons mistake such thick urine for highly organised matter. I have known persons to become almost hypochondriac through not knowing that such deposits are of little consequence at first, and can be easily treated. But what are we to do for those who habitually pass the cayenne-pepper crystals of uric acid or small calculi? You will first seek the patient's antecedents, and learn all that he has to tell you of his habits, his diet, and his family history; and your mode of treatment will be determined accordingly. First of all, let me speak of the general principles upon which the treatment should be conducted. A very simple rule—indeed, too simple, I think—is often adopted. When the urine has persistently and habitually thrown down acid deposits, the patient has generally been prescribed alkalies: if, on the contrary, he has had alkaline deposits, he has been treated with acids. That simple mode has too often formed the main portion of the treatment. In the former case he has soda or potash largely administered, or he has been told to drink so many glasses of Vichy water, which is mainly a strong solution of carbonate of soda, only it is a natural instead of an artificial one. Now, it is quite true that with alkalies, provided enough be taken, these deposits will disappear; the uric acid will no longer be deposited; the urine will become less irritating; the annoying symptoms will be diminished or got rid of. And of course the patient is very much pleased with this new condition of clear urine and disappearance of all deposit. And you will say, 'What more can be desired?' Much: you have merely made his enemy disappear; he is by no means rid of its presence: for you have not checked the acid formation. The uric acid is there, and probably in quantity as much as ever; but the uric acid and the urates are soluble in alkali, and you have only rendered them invisible. You really have the same condition as that of the fabled ostrich, which is said to put its head in the bush when pursued by hunters, and, no longer seeing them, to believe itself secure. Just such is the security of the patient with uric acid who trusts solely to alkalies or to Vichy water. His surplus deposits have become unrecognisable by vision; nothing more. I do not say the alkalies have been absolutely unserviceable as regards his constitutional state, but they will not improve it to any great extent; and when he leaves them off the acid shows itself again. And further, I believe there is reason to conclude that large quantities of alkali habitually taken, exercise an injurious influence on the viscera. Diuretics must be regarded in the same light. In those cases which are treated with diuretics, such as nitrate or acetate of potash, &c., the secretion of water is no doubt increased *quoad* the amount of solids, and the solids are thus dissolved. The same thing happens with that infinitely more popular one, so punctually and faithfully swallowed by the patient who has once obtained any medical sanction for its use—I mean whiskey and water. In all such instances, what you have chiefly done has been to stimulate the kidneys, already overworked, to do more. You have by no means cured the patient of his gravel, and may be happy if he is no worse for the remedies.

Next, let us ask what is the real pathology of these cases, and then I think I shall be able to show you a more efficient remedy. The problem has presented itself to me with great force and frequency, because people, naturally fearing they may arrive at the stage of calculous formation, come for advice in the earliest stages, and with the strongest desire to avoid the advanced one of stone in the bladder. So far from its being desirable to send them to Vichy, or to give them alkalies, I believe such patients can be more effectually dealt with by a different mode of treatment. Let me premise in broad and simple terms—as our time here, and, I may perhaps add, the extent of our knowledge, will not permit me to be more minute or exact in detail—that the origin of what we call gouty symptoms, as well as of a superabundant uric-acid deposit in the urine, is due to defective assimilation on the part of organs associated with or forming the primæ viæ. I am quite aware that it is common in practice to speak somewhat confidently of the liver, its action, and its states, although we have still a good deal to learn about all this. Some years ago we talked and acted as if we were thoroughly acquainted with the liver and its functions; but during the last fifteen or twenty years new light has been thrown upon the subject by Bernard, Pavy, and other workers in the same field, and we have learned that the more we inquired the less did we certainly know of its natural functions, still less of its action in disease. Thus, if one thing were more settled than another, at least since the time of Abernethy, it was that mercury had a specific influence on that organ; but now we find that there may be grounds for believing that the action supposed has no existence at all. There were other agents, indeed, which were vaunted to take the place of mercury, but no one ever thought of disputing the fact that you could augment at will the bile secretion by administering that famous drug. I am not here to say whether that is so or not, but it seems to have been proved that there are substantial reasons for doubting if our ancient faith in that dogma be tenable. In speaking, then, of the 'defective action of the liver,' or of 'torpor of the liver,' I merely use provisional terms, which most will easily understand as indicating more or less distinctly a certain set of symptoms. Let them be briefly described as mainly consisting of a constant, or almost constant, deficient excreting function by the bowels, sometimes, but by no means always, associated with impaired appetite and slow or uneasy digestion; these latter being often absent if the diet is carefully selected, or if the patient lives in the open air and takes much exercise. On the other hand, considerable and multiform symptoms of disturbed digestion may be frequently present. I cannot positively state whether those phenomena are really due to inactivity of the organ in question; practically, for us to-day, this does not signify much, but the current terms are still convenient formularies until better ones can be substituted for describing the condition in question.

Now, at the bottom of this tendency to uric-acid production there often lies what is thus understood as inactivity of the liver; and the true rationale of the unduly large formation of the urinary *salts appears to* be that, the liver or some *allied organ not doing its duty* as an excreting organ, the kidneys have more work than is natural thrown upon them. Thus the solid matters of the urine, or rather some of its ordinary constituents, are augmented—not all of them, for urea is not necessarily increased, but uric acid is largely produced, and is eliminated not only in solution but in crystalline forms. Uric acid is very insoluble in water; and although the quantity thrown out may be quite soluble at the natural temperature of the urine (100° Fahr.), when this diminishes to 60°, 50°, or 40°, the acid is deposited, and when the quantity becomes larger still, even the ordinary amount of fluid associated with it at a temperature of 100° will not suffice to dissolve the whole, and solid uric acid is deposited in some part of the urinary passages. This deposit may take place in the kidneys themselves, giving rise, if not thrown off, to the formation of calculus, at first renal, but sooner or later mostly becoming vesical. Now, if all this be so, the formation of uric acid gravel is not by any means to be regarded as necessarily disease of the kidney; on the contrary, it is the result of an active and capable organ vicariously relieving some other organ, the function of which is torpid. The true remedy, therefore, is not to stimulate the kidneys, already overworked —not, to use a familiar simile, to lash that horse of the team which is already doing too much work, but you are to seek the cause in that other one of the team which is doing deficient work, and that is almost invariably the liver, in the sense already explained.

The treatment, then, which I advise you to pursue is to employ such agents as will stimulate the excretory action by the primæ viæ without depressing vital power. No doubt that a powerful agent for the purpose is mercury; and it is quite unquestionable that relief of the symptoms above alluded to is to be obtained in a remarkable manner by occasional small doses of that drug. For our purpose, however, it is not always necessary, nor can it be considered so harmless for prolonged action, as another class of agents—I mean, certain kinds of natural mineral waters. These I also regard as greatly superior, in these maladies, to taraxacum, nitric acid, alkalies, and the other substitutes, as they have been termed, for mercurial remedies, in promoting the function of the liver. Now, the mineral waters which I am about to describe belong to a group of springs all containing sulphate of soda, and some of them sulphate of magnesia also, in solution. In studying these waters, I wish you to look with me at the composition of them, and at the same time to dismiss from your mind entirely those views of medicinal doses which you have acquired in the dispensary, and which necessarily belong to it, since small quantities of drugs, as they exist in mineral waters, will act more freely than will those quantities combined after the ordinary pharmaceutical method. You ask me for a demonstration, and I am quite ready to give it you. At the same time, let me caution you against regarding the small doses of mineral waters as having any affinity, either in the matter of quantity or by manner of administration, with what is understood as 'infinitesimal' doses. Thus, for example, you know that you may give A an ounce of salts, or B half an ounce, and you purge them; but you may obtain the same effect with one-fifth of those quantities if the patient takes it as prepared in Nature's laboratory—that is, in the form of mineral water. It is a curious fact, which I give as an ultimate one, and without speculating here on the cause of the difference. As a proof of the superior force of the saline combinations found in natural springs, I may refer you to the following experiment. If you will reduce by careful evaporation, as I have done, such mineral waters to their pharmaceutical condition of crystallised salts, you will find them possessing little, if any more, power than similar salts as obtained by the ordinary processes, and met with in every chemist's shop. They no longer do their work on the same terms as when administered in the original water before they were separated by evaporation. You will therefore readily understand how essential to our end it is to employ the natural mineral waters; since what are called 'artificial waters,' however admirably prepared, are simply pharmaceutical products, and are destitute of the very quality which distinguishes the remedies they are designed to imitate.

Here is a table of the waters which I refer to, with a comparative synopsis of their distinguishing saline contents, representing the number of grains (without chloride of sodium and other less active agents which are also present) in an English pint. Below these I add two well-known alkaline waters.

—	Sulphate of Soda	Sulphate of Magnesia	Carbonate of Soda	Other Ingredients
Saline:	Grs.	Grs.	Grs.	
Püllna . . .	154	116	—	
Hunyadi Janos .	150	148	—	
Friedrichshalle .	58	49	—	Little iron
Marienbad (Kreuz)	48	—	9	
Carlsbad (Sprüdel)	25	—	13	Little iron
Franzensbad . .	30	—	6	
Alkaline:				
Vichy (Celestins) about . .	3	—	47	Little iron
Vals (Magdeleine) about .	—	—	65	Little iron

The most powerful water of the saline group is that of Hunyadi Janos, a Hungarian water, which contains about two and a half drachms each of sulphate of soda and sulphate of magnesia in an English pint; next and nearly equal to it is that of Püllna, which contains 154 grains, or about 2½ drachms, of sulphate of soda to the pint, and nearly 2 drachms of sulphate of magnesia. Those quantities of the commercial salts would give a tolerably efficient purge to anybody. But you must not give a pint of either; 5 ounces would be a full dose. I do not like Püllna generally for our purpose, because it purges too freely, often gripes, and is very nauseous; Hunyadi Janos is less so. Half a drachm of sulphate of soda and half a drachm of sulphate of magnesia in a natural mineral water suffice as an aperient for most people. On the whole, there is no better aperient water than Friedrichshalle; although an equivalent dose of Hunyadi Janos, which is barely one-half the quantity by measure, is often more convenient on that account. Supposing that we order Friedrichshalle, which contains not a drachm of sulphate of soda in a pint, and little more than three-quarters of a drachm of sulphate of magnesia; yet eight or nine ounces make an efficient purge; for many persons six or seven suffice. I think I may say that seven ounces is an ordinary average dose, and it should be warmed and diluted too, adding, say a third or a half of its bulk of hot plain water. If seven ounces of Friedrichshalle water are taken in the early morning, an hour before breakfast, comprising the cup or two of hot fluid usually taken then, a full, free action of the bowels will probably follow soon after; perhaps two. That quantity, you see, would contain about 25 grains of sulphate of soda and 20 grains of sulphate of magnesia, which, taken in any combination you please from a druggist's drawer, would have no appreciable action; the patient might be a little uncomfortable perhaps, but there would be no action of the bowels. To repeat what I have said: if you evaporate a quantity of Friedrichshalle water in a warm water bath so as to avoid decomposition of the salt, or even loss of the water of crystallisation, and so obtain as perfect a product as a chemist can produce, and administer four times as much of this salt as that which exists in a dose of the natural water, you will still not produce such efficient or certain results as the small quantity contained in the natural water will give. So that there is something, which I do not pretend to explain, and certainly shall not speculate about here, which distinguishes the action of mineral waters from the action of salts which are made by our pharmaceutical processes.

The next water on my list is that of Marienbad, and it contains no sulphate of magnesia, 48 grains of sulphate of soda in the pint, with 9 grains of carbonate of soda, and a small quantity of iron. With these constituents, there is enough free carbonic acid to make it an agreeable and slightly sparkling draught. Rather more than half a pint produces for most persons an easy motion. If this water is exposed to the air for a day or two, there will be an obvious brown deposit of the iron, and it may be regarded as a slightly ferruginous water, although this character is not important for our purpose. If there were a sufficiently large demand for it to enable us to have it quite fresh, it would be an admirable remedy here. But it bears transport badly, soon losing its carbonic acid, and depositing its iron, besides becoming less palatable, and light for the stomach.

Carlsbad is next to be noticed, with its many springs, all of which contain about 20 grains of sulphate of soda and 13 of carbonate of soda in the pint; and contrary to the common belief, differ from each other solely in point of temperature, which is very high in the Sprüdel, the central source, and in the remotest is *higher than* that of the human body. *Carlsbad water is often supposed* to be purgative, but is not so unless taken very largely. No quantity ever given here exerts a laxative action on the bowels. The influence it exercises on the animal economy, although probably chiefly due to the sulphate of soda element, is not in any way as an aperient. The 'Carlsbad Salts,' which are widely and popularly known as an aperient, but sold at an exorbitant price and bringing a vast revenue to the Carlsbad makers, are simply sulphate of soda (with perhaps a trace of carbonate) or 'Glauber's salts;' and differ in no respect, except in name, from that common but valuable aperient, as made here and in other countries.

Then we come to the water of Franzensbad, which contains 30 grains of sulphate of soda, 6 of carbonate, and a little iron, which Carlsbad does not. That closes this group of springs.

Next I shall just point out the distinctive characters of the alkaline waters which are so popular in this country. First and best known is that of Vichy, which contains only 3 grains of sulphate of soda, but nearly 50 grains of carbonate of soda, in the pint—a powerful solution. After that is the water of Vals, which is also from the volcanic district of France, some of the springs of which contain upwards of 60 grains of carbonate of soda, and nothing else worth mentioning. These two waters are extremely famous, and their sources are much resorted to by patients for the cure of gout and gravel. The waters are also largely exported to other countries. Another alkaline water is that of Evian, on the south shore of the Lake of Geneva, which I name here because it has a certain reputation as a resort for calculous patients. The alkaline constituent, carbonate of soda, is present, however, in very small quantity, and this spring ranks, as regards the influence of that agent, below the others named.

Under the continued daily use of strong alkaline waters, the uric-acid deposits disappear—that is, they are dissolved by the alkali. Inasmuch, also, as this appears to have some beneficial action on the liver, a certain degree of benefit is perhaps also attained. Thus such patients are often better for a time after a visit to Vichy; but, as a rule, are not permanently benefited. I am satisfied, after observation on the spot, and also of the effect of the waters taken here, that they only temporarily mitigate the complaint, and do not cure it. Now, the principle upon which the waters of Friedrichshalle and Carlsbad are beneficial is, that they produce activity in all the digestive functions, and thus waste matters which have been hitherto thrown out as uric acid by the kidney are eliminated in some other form. And thus it is that, if it be desirable to recommend resort to a mineral spring as treatment for uric-acid deposits, I prefer Carlsbad, and never send a patient to Vichy, Vals or Evian. At the same time no person who is feeble in health should be thus sent abroad: for all these waters have, especially if taken in the quantity usually given at their sources, a marked tendency to reduce weight and power. Often, however, the condition of the patients in question is not notably depressed, and a Carlsbad course may be taken with advantage. At the same time, I firmly believe that it can in the majority of instances be more successfully pursued at home, than by sending the patient abroad. Of course when considerable benefit may be expected to accrue by removing him from the influence of business habits and associations, by all means let the spring itself be visited. But in ordinary circumstances, the best results may be obtained here by commencing with a little Friedrichshalle or Hunyadi Janos water, combining it in a day or two with Carlsbad, and gradually diminishing the quantity of the aperient water, and increasing the other according to the judgment of the medical attendant who knows his patient's habits and constitution, and who watches the action of the waters, and strictly regulates the diet throughout the course.

It is necessary to illustrate with a little more detail the mode of administering these agents. A patient who has been passing gravel seeks your aid, showing evidences of deranged digestion, perhaps with constipated bowels and irregular appetite; you will find it advantageous to commence with a little blue pill at night, followed next morning by eight or ten ounces of Friedrichshalle water, or half that quantity of Hunyadi Janos, taken with a little hot plain water. On the succeeding morning, give three or four ounces of Hunyadi Janos with three or four of hot water; on the next morning, two ounces, with six or seven ounces of Carlsbad, and hot water daily, say until the end of the first week. If the bowels are not moved at least once easily, soon after breakfast, increase a little the quantity of the aperient water; if, on the contrary, there is more than gentle action, diminish the dose. One of the characteristics of Hunyadi Janos is, that the longer it is taken the smaller is the quantity necessary to act as an aperient. If, for example, seven or eight ounces taken in the morning, say with five ounces of hot water, produce one active movement of the bowels immediately after breakfast, the next morning six or seven ounces, and the morning after probably five or six ounces will do the same; and it is very likely that at the end of ten days the patient will from four ounces experience the same effect produced originally by seven or eight. But after you have given it thus for a week or so, according to the nature of the case and the results, you should increase the Carlsbad, giving six or seven ounces with one or two of Hunyadi Janos, and three or four of hot water every morning. When this or Friedrichshalle is given alone, and also when it is mixed with Carlsbad, 20 or 30 per cent. of hot water should be added that it may resemble somewhat the natural condition of the spring. Friedrichshalle is naturally hot, and is evaporated on the spot to a small extent, being regulated and rendered uniform by stopping the process when the water reaches a certain specific gravity; 1·022 at 54½° Fahr. After having tried combination of the waters for two or three weeks, seven or eight ounces of Carlsbad may be taken alone for another fortnight or more; and if the bowels do not act fairly, one or two ounces of Friedrichshalle or Hunyadi may still be added. Carlsbad, which at the spring is too hot to drink until cooled, should, when taken alone and unmixed, be raised in temperature to 90° or 100°, by placing the tumbler containing it in a vessel of hot water for a few minutes. The quantities given are considerably less than those administered at the spa itself, where a patient's stay is necessarily limited as to time. I am quite satisfied that the smaller quantity here recommended, and employed during six or nine weeks, instead of the usual three weeks of a foreign course, is better for a majority of the patients we have to deal with. The same quantity of water given abroad in twenty-one days, producing often notable loss of weight and power, will, if given at home in fifty or sixty days, attain the object as certainly and more safely. I by no means dispute that there are other cases which may be benefited by the more heroic plan adopted on the spot. I have largely and systematically employed these agents more than twenty years, modifying the quantity and the mode as experience has indicated, and the system thus briefly described is the result of it. The course may be repeated with advantage, if necessary, for many patients after an interval of three or four months. Meantime, as an occasional aperient and as a corrector of digestion in these case, few things are better than the aperient waters named. They leave the patient as a rule less constipated after discontinuing it than he was before; and, as already said, may be taken habitually without lowering the system. I have known patients continuing their daily use for three or four years, but I cannot advise this course unless in exceptional cases. Nevertheless, I know a gentleman, nearly eighty years old, who has taken it for five years regularly, a wine-glass every morning, and the effect has been for him most admirable. Suffering much formerly from an obstinate constipation, he enjoys perfect regularity and excellent health. Let me say here that the 'Carlsbad salt' just referred to is often used in the belief that it represents Carlsbad water. You have already learned that it consists almost entirely of sulphate of soda taken from the water, and has the same and no more virtue than such a salt obtained from any other source. No doubt the sulphate of soda, known also as 'Glauber's salt,' is one of the most admirable medicines we possess, and deserves to be more popular than it is. I have constantly ordered it, with or without a small addition of sulphate of magnesia, for the out-patients of the hospital, as the best substitute within their reach for the mineral waters in question.

There are some cases in which very small doses of blue-pill may be most usefully employed; those naturally in whom the appetite and digestion do not much improve under the use of the water alone. I am quite satisfied in most instances with an eighth of a grain combined with three or four grains of compound rhubarb pill, and taken every night, or every second night, during the *former part of the course. Many* persons in whom doses of two or three grains cause painful depression derive manifest benefit from the small quantity named. If any one doubts the effect of an $\frac{1}{8}$ or even of the $\frac{1}{12}$ of a grain of blue pill, let him try the ordinary five-grain compound rhubarb pill, with and without the fractional addition, and the difference will be easily understood.

In the few minutes which remain I will advert briefly to the subject of diet, certain restrictions in which are extremely important. It used to be said that when uric acid is largely deposited, the nitrogenous elements of the food should be considerably diminished. I do not find in practice that a strict application of this rule is advantageous. On the contrary, diminution of the deposit is more certainly attained by a course which is almost the opposite of that. There are three elements among matters ordinarily taken as diet which in order to attain the end in view must be permitted to the patient very sparingly—viz., alcohol, saccharine and fatty matters. First, alcohol: any fermented liquor permitted as an article of diet should be selected in its more diluted and in its purest form. No doubt, for most patients, the best course is to relinquish altogether the habit of taking it. That it is not only not essential to health as a rule, but is absolutely prejudicial to most persons, I am firmly convinced; but especially, however, to the 'torpid liver' is it deleterious. No doubt, after long experience of the use of wine and beer, total abstinence at first entails no little hardship on some persons. They feel keenly for two or three months, or even more, the loss of their customary stimulus. In most instances, however, when this term has been passed, they are better, stronger, and no longer feel the want of alcoholic liquor. But if the sacrifice is too great, or if there is a reason to believe that it is desirable, at all events while commencing the course of waters, not to make so great a change—and that is, I think, the preferable course—I advise that form of alcohol which exists in light natural wines, such for example as a light sound Bordeaux, or a Rhine wine of similar quality, the former perhaps agreeing better with most persons here. You will forbid champagne, as for the most part imperfectly constituted, and always bad if containing much of the sweet compound often largely added and known as 'liqueur.' The stronger wines, as sherry and port, are most unsuitable, and strong beer is to be absolutely forbidden. Solutions of pure spirit and water may perhaps be desirable by exception for a very few persons with weak digestion. Secondly, sugar in all its forms, at every meal and wherever met with, in whatever dish, as jam, stewed fruit, pudding, &c.—forbid it altogether. Of the undesirable effect of saccharine matters in these cases I have a large experience. Thirdly, let fatty matters, butter, cream, and the fat of meat, whether simply cooked or in combination to form pastry, be taken very sparingly.

I cannot enlarge on the theory on which the foregoing advice is given. Suffice it to say that abstinence from the substances named probably lightens considerably the work of the liver, and so lessens the vicarious labour of the kidneys in accordance with the views already propounded. Let me just advert, however, to the dietetic system in force at Carlsbad. Apparently in recognition of the principle explained above, the use of sugar and of butter is absolutely forbidden during a Carlsbad course; and were you patients there, your purveyor would not supply you with the forbidden food, however much you might demand it. I can only say, as the result of observation, that this system, much more than the elimination of meat from the dietary, will reduce the uric-acid deposit. If you will cut off a portion of alcoholic stimulant when necessary—and it mostly is so, while in some cases, as we have seen, you may certainly with advantage forbid it altogether; if you will forbid everything that contains sugar, and diminish considerably all fatty matter—permitting nitrogenous food in fact, although only in moderate quantity, and diminishing greatly hydrocarbons—you will generally accomplish more than by the contrary method. At the same time, there is no doubt that animal food in the form of poultry, game, and fish, constitutes a better dietary than the unvarying recurrence of beef or mutton twice or even thrice a day. The nutritious farinaceæ such as wheaten meal, oatmeal, pearl barley, maccaroni, lentils, haricots and peas, in the numerous palatable yet simple modes in which they may, with very little culinary intelligence, be presented, ought to occupy a large place in the daily food. There is another class of aliments, too, neglected by most people, in this country especially, which is particularly to be recommended here: I mean fresh green vegetables, for the most part cooked, of all descriptions. A sufficient quantity should be taken, at two meals in the day, to form an important portion of the daily nutriment. With many a light salad will agree, and if so it is quite admissible. Apples, also, baked or stewed, without sugar, may be taken, but not fruits containing much sugar—as grapes, pears, strawberries, and plums. The question of eggs and milk is one somewhat apart. If the former agree—and this is quite a matter of individual experience, and thus to be determined—there is no objection to their moderate use. As to milk, as a rule it is undesirable for the cases we are considering, as an article of diet—that is, when taken in quantity. As a therapeutic agent, it is often the source of much discomfort, and is often not digested. Remove its cream, and it becomes a wholesome drink, although not a very nutritious one. Excellent as milk is for the growing animal, and consequently for our children, who thrive on it, the elderly adult with inactive liver, with gravel and gout, often finds it not merely useless, but injurious. To this brief but important sketch of a large subject I will only add, that besides thus enjoining strict attention to diet, you will of course direct that the patient takes daily a fair amount of exercise in the open air, and that he protects his skin and encourages the performance of its functions by habitual ablutions and sufficient clothing. These points I can only name; but they are essential concomitants to the rest.

Well, then, it is this system of diet and regimen, and the occasional systematic employment of the mineral waters named, which mainly constitute the treatment I strongly advise for the purpose of checking calculous disease in its early stages, and so to prevent the formation of stone in the bladder in that considerable majority of cases which are due to uric-acid formation and its consequences.

LECTURE XVIII.

ON THE TREATMENT OF STONE IN THE BLADDER BY SOLVENTS: ITS HISTORY AND PRACTICE.

Gentlemen,—The inquiry as to whether it be possible by the use of medicinal or chemical agents to dissolve stone in the bladder, and so to avoid any operative proceedings for its removal, is one which is evidently exciting a good deal of interest at the present moment (1873).[1] During how many centuries has this question appeared and reappeared! Some accident calls public attention to it, much is written and said; little is done, and less is realised, in relation to this most desirable object; after which a cycle of indifference follows. Meantime, as the sum of these reiterated efforts, some sort of progress results. Nevertheless the subject is scarcely considered in standard surgical works, although it is one fraught with interest to us all. For myself, I confess, it has always had a degree of fascination. It would be so great a triumph to our art to dissolve the stone without damage to the delicate structures in which it arises and finds its residence. And thus it is that I have not only alluded to it in various works, but have discussed it at considerable length many years ago in one of them.

I propose therefore to tell you what has been done, and what at present appears to be attainable by the agents employed; in short, to sketch the history of solvents for stone in the bladder from the earliest period to the present day.

You know that the existence of calculus was recognised, and that a cutting operation for its removal, at all events in the cases of boys, was practised, a few centuries before the Christian era. In course of time the attempt was made to dissolve it, especially in the case of adults. It appears that neither Hippocrates nor Galen entertained the belief that this was possible. One of the earliest allusions to the practice is found in Pliny, who says that 'the ashes of burned snails' shells are good for expelling the stone.' Aretæus (second century) recommends 'quicklime in honeyed water' for the same purpose. Later authors, quoted by Paulus Ægineta (seventh century), speak confidently of the efficacy of goat's blood, and they observe that some solvents wrongly given increase the size of the calculus.

Arriving at the period when medicine flourished in Arabia, we find numerous remedies and complicated combinations systematically given. The celebrated Avicenna (about the tenth century) enumerates many substances supposed to be efficacious. He and others of his time employed occasionally an impure carbonate of potash; but as an example of the kind of prescription current at this period, I give you one of them in full, translated from Avicenna, as it is a curiosity, and gives you a good idea of the very complicated mixture which sometimes constituted an ancient medicine:—'Take equal parts of calcined glass, of the ashes of scorpions, of the ashes of the root of colewort, of the ashes of a hare, of the ashes of egg-shells from which the chickens have escaped, of the stones found in the sponge, of goat's blood dried and powdered, of lapidis judaici, the same of parsley, wild carrots, marshmallow-seeds, and gum arabic. Make it into an electuary with honey.'[1]

Between this period and the fifteenth century we can mark no advance. About this time Basilius recommended the internal use of an alkaline salt, obtained from the cuttings of the vine in spring; this, on the authority of Boerhaave.[2] Crollius, in his Basilica Chymica (Frankfort, 1608), recommended the patient to take a salt of tartar (carbonate of potash) in an infusion of parsley, and also some solutions of which lime was the principal ingredient. In 1650 Daniel Sennertus directs the internal use of the same remedies, and also that they should be injected into the bladder through a catheter. About the same time, Riverius, physician to the French Court, advises, as many others also did, the ashes of calcined egg-shells. The dose was a drachm of the powder, which was of course chiefly lime, to be given in white wine or with diluents twice a day; and it is stated that 'potenter expellit calculum in urinæ meatibus hærentem.'[1] Numerous other authorities might be quoted as repeating all these receipts with little or no variation.

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[1] *When the Emperor* Napoleon III. was known *o be the subject of stone.*

[1] Avicenna, lib. iii. fen. xviii. trac. i. c. xix.

[2] *Elem. Chimiæ*, 1732, vol. ii. p. 73.

Next in order comes, in this country, the famous Mrs. Joanna Stephens. This lady had acquired so great a reputation in the earlier part of the last century, that in 1739 the English Parliament, after a formal inquiry, purchased her secret for dissolving the stone at the cost of 5000*l.*—a circumstance which produced a large and remarkable literature during the next few years, and gave a great stimulus to research. The document, which was obtained at this cost, commences thus:—

'My medicines are a powder, a decoction, and pills. The powder consists of egg-shells and snails, both calcined. The decoction is made by boiling some herbs (together with a ball which consists of soap, swine's cresses burnt to blackness, and honey) in water. The pills consist of snails calcined, wild carrot-seeds, burdock-seeds, ashen keyes, hips and hawes, all burnt to blackness, soap, and honey.'[2]

The quantity given was a drachm of the powder three times a day, mixed in cyder or other liquor, and followed by half a pint of the decoction. If the decoction disagreed with the stomach, the pills were to be substituted. These compounds were found to be very nauseous, and were superseded by other agents.

After this, Dr. Whytt, Professor of Medicine in the University of Edinburgh (1761), brought soap and lime-water into favour, giving one ounce of 'Alicant soap' and three pints of lime-water daily, and illustrating its use by a remarkable case or two.

In the hands of Blackrie (1766), Chittick—who made all his patients send locked cans of veal broth daily to his house that he might add the solvent and preserve his secret—and others, mixed solutions of potash and lime were much employed; and a considerable amount of evidence of their utility to allay pain was published on good authority. Soap leys of different strengths furnished the potash in many cases; in others the 'salt' of tartar was given, and always in a very diluted form.

In France at an early date alkaline remedies had many advocates, such as Darcet (1726)[1] and Pierre Desault (1736). Morand, the famous surgeon of Paris, who came to London to report to the French Academy on Cheselden's operation of lithotomy, made also very careful observations on forty patients treated by Mrs. Stephens's remedies. He was unable to certify to a single case of removal by the solvent, but said that four 'thought themselves cured.' Much later the subject of alkaline solvents was investigated by Fourcroy and Vauquelin; more recently by C. Petit (1834). The first and last named employed the Vichy waters. In Italy Girardi (1764) recommended the use of solvents, but extolled especially the virtues of a decoction of uva ursi for that purpose.

Meantime the vegetable kingdom had been largely explored for the same purpose. It will suffice to give a list of a few of the principal plants so employed during the last two or three centuries. I shall name those only which enjoyed the greatest favour. The 'Banke cress,' or 'saxifrage,' (the name being due to its reputed virtue): its seeds boiled in decoction of couch grass; dose of the seeds one drachm. Tincture of the 'Pimpinella saxifraga.' A tincture of the seeds of the 'Lithospermum majus,' or 'great gromell.' The decoction of 'Broome;' a tincture of the seeds of 'Fraxinella.' Tincture of the root of the 'Raphanus sativus,' or garden radish. Tincture of the seeds of the common nettle. The marsh and yellow mallows, the couch grass, parsley, and the wild carrot were also ingredients in the compound decoctions employed.

And now I come to the experience of to-day. And I suppose you to inquire, What are the existing resources available for a patient who desires at the present time to attempt the solution of a stone in his bladder?

I shall divide these into two classes. First, there are the empirical remedies, which have a certain reputation; and secondly, there is the result of the latest investigation of the subject by scientific observers.

First, the empirical remedies. It is a curious fact that in almost every European country there exist certain persons who obtain a livelihood by making and selling remedies to dissolve the stone. The recipes employed are usually family heirlooms, and a sort of reputation clings to the family, each generation of which carefully preserves the secret, such as it is, and the traditions of their predecessors. In the same way the art of bone-setting, as you no doubt know, is associated with certain names and localities: an art the nature of which was so well discussed and appreciated by Sir James Paget in one of his admirable clinical lectures about five years ago. The liquid solvents—for they usually take that form now—are sold in this country under the name of 'constitution water,' or some similar term; and they are moreover guaranteed to be useful in all forms of urinary disease.

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[1] Riverius, *Praxis Medica*, Lugd., 1657, p. 381.

[2] *Gentleman's Magazine*, June 1739, vol. ix. p. 298.

[1] Annales de Chimie. Paris.

Peculiar circumstances have given me large opportunities of observing and examining these agents. I have met with them here and in different parts of France. I well remember an old Frenchwoman and her son journeying on foot from the south of France to Brussels, about ten years ago, laden with a basket of heavy bottles filled with the family nostrum for presentation to a royal patient there.[1] I may add that her devotion was substantially rewarded. Such unsolicited contributions, either material, as in this case, or by way of suggestion, of every conceivable kind, flowed in then from every part of Europe; and such is always the case in similar circumstances.

I may here tell you that I have recently received numerous communications on this subject from known and unknown correspondents, urging on me the value of the recipes which belong to the writers. I shall select two which widely differ, for mention here, each possessing interest of its own kind. One was from a French gentleman, who gives me his name, and offers an infallible cure for the stone, which of course he does not describe, but consents to communicate it for the moderate sum of a million of francs (40,000*l.* sterling); and I do not hesitate to say it would be well worth the cost if it could accomplish the wonderful results alleged to be within its power. The other is from an English labourer in Bedfordshire, who wishes me to know what cured his friend some time ago in the neighbouring parish. He freely presents me with the formula, and it is a fair specimen of a good country recipe for the purpose—for I have seen many such—and it has some interest for us, as we shall find hereafter. I could not help writing my thanks to this man in reply, and was at some trouble to *explain why his* remedy might be good in some cases, and why it might be prejudicial in others. Here it is in his own words: 'Get a peck of wood-ashes, and pour on them a gallon of boiling water; let it stand twenty-four hours: then strain it off as clear as possible, and take a wineglassful every morning, fasting.' This is a large dose of carbonate of potash; our old friend, the alkali, you see, always recurring. I had the curiosity to determine the quantity. A ley of wood-ashes thus made from pine-wood furnishes a solution of fifty grains of the carbonate to the ounce, so that the quantity taken at once was at least a drachm and a half or two drachms. The other soluble constituents of the ley are sulphate and silicate of potash and chloride of potassium.

Now, as to the more pretentious compounds which are sold in this country as solvents, I have submitted the chief to careful chemical analysis, and I intend to present you with the result. Not that I had any doubt as to what their general characters and composition were, nor of the fact that they were all nearly alike in their composition. But I wish you to have an exact statement founded on analysis. A recent examination of a well-known and typical one in some repute in this country, two bottles of which are placed before you, and which you may have for your own analysis if you please, is a simple undisguised solution of bicarbonate of potash in water. You see that they are ordinary wine-bottles, the old 'wine-quart;' each contains about an ounce of bicarbonate of potash and fifteen grains of chloride of sodium—with a few sulphates in minute quantity, and possibly due to the spring water of which evidently the solution is made. Half the bottle, which is equivalent to four drachms, is directed to be taken daily. The price at which this 'constitution water' is sold is three shillings and sixpence the bottle!

At this point, let us make a rapid survey of this long and curious history of man's painful, slow, and somewhat clumsy efforts to rid himself by medicine of his terrible enemy the stone. Observe that the agents have always been alkaline. At first, and chiefly, the alkaline earth, lime: you mark it as the agent in the calcined snail-shells of Pliny and the egg-shells of Avicenna, which do but reappear in that expensive prescription of Mrs. Stephens in 1739; but in Avicenna's time it was combined with potash, the representative alkali of the vegetable kingdom, as you see in the quantity of burned plants which enter into the composition; and Mrs. Stephens, probably without knowing it, employed also potash and soda in her addition of soap and calcined weeds and seeds to the egg-shells. Then lime-water and soap came next into fashion, giving a combination of the three alkaline agents named. And the popular remedy of to-day before you, sold at so high a price to the purchaser, and of which a large quantity is ordered to be taken daily for three months, as the minimum dose and time, is, as you have just seen, a simple solution of bicarbonate of potash in water; and the cost of it to the seller is actually less than that of the bottle and the cork which enclose it! Our country labourer's nostrum is nearly as good in form, has precisely the same solvent power, and is almost absolutely without cost.

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[1] *The late King Leopold I. of Belgium.*

Then there is another popular remedy —namely, Vichy water, which is so largely employed by patients with urinary maladies, and which in its time has been vaunted for its solvent powers on the ground that it consists mainly of a strong solution of carbonate of soda, the alkali of the mineral kingdom.

We are now in a position to arrive at the following conclusion, the only one possible—viz., that all the quack and would-be secret medicines employed from time immemorial to the present day are solutions of either lime, soda, or potash, alone or combined. All the plants, after combustion, furnish alike only one and the same active agent—viz., potash; all shells, whether of eggs or of marine and land animals, furnish alike only one and the same active agent—viz., lime.

Lastly, the medicinal remedies employed by the faculty everywhere, at the present day, are hydrate of potash, in the form of liquor potassæ; the bicarbonate, the citrate, the acetate, and the tartrate of potash. After them, and less generally employed, are soda and lithia in different forms.

Now, before entering on any consideration of the applicability of all these agents as solvents, from a scientific and not from an empirical point of view, it is necessary to examine briefly the substances they are destined to act upon—namely, the stones in the kidney or the bladder which it is desired to dissolve. And the first fact that must strike you at the outset is, that these calculi are of different kinds; some having characters diametrically opposite to those of another kind. And the question naturally arises, Is it possible that one form of remedy—namely, the alkaline agent—can be adapted to dissolve calculi whose composition is so varied?

I shall remind you of those general terms which I used in a recent lecture on that subject to classify the varieties of urinary calculi. Three-fifths of all the calculi met with among adults of all ages are composed of uric acid and the urates; nearly two-fifths are chiefly phosphatic, several of which are 'mixed'—that is, contain at least two different constituents—and about 3 or 4 per cent. are oxalate of lime. Cystine is too rare to be admitted to our reckoning. Three-fifths at least, then, are the products of a urine abounding in acid, of which excess they are the expression. The remaining two-fifths are the product of urine generally alkaline, mostly ammoniacal, of which condition they are the result. The urates, the oxalates, and a very few of the phosphates, are formed in the kidney, and are the product of certain constitutional derangements; the greater part of the phosphatic material, whether in mixed or in phosphatic stones, is produced solely in the bladder, and is the product, not of a constitutional state, but of local disease there. Now, uric acid we know, by experiments conducted out of the body, to be easily soluble in alkaline solutions, but some of these have a more energetic solvent action than others; and the resulting salts vary in solubility. Thus, urate of lime is a rather soluble salt. Urate of soda is less so, and in this form enters into the composition of some calculi. Urate of potash is more soluble than either of them. Potash, the alkali of the vegetable kingdom, appears to be the most powerful agent (although lithia may be nearly equal) that can be employed on a uric-acid calculus, among those materials which can be taken internally for a long period of time with comparative impunity. These facts, then, indicate it as the most desirable solvent to employ under certain conditions, hereafter to be described, and as such it has long been regarded. Nearly thirty years ago I called attention to its pre-eminence for this purpose, stating that the 'citrates and carbonates of potash are more potent and certain than Vichy water' for the treatment of 'uric acid in the form of gravel'; and that they should be given largely diluted, pure water itself being one of the best solvents.[1] I may add, that I have always declined to prescribe Vichy water for any urinary affection, and on the ground of its inferiority to the potash solutions. I think the citrate of potash may be fairly said to be the salt which of all others offers the best chance of success; and this by the common consent of all who have examined the subject. If, however, it exerts too much diuretic action, as in some cases it seems to do, the next best may be employed—namely, the bicarbonate, or the liquor potassæ.

A question of great interest comes before us here—Has citrate of potash been fairly tried on stone in the bladder by a competent observer? I am happy in being able to answer this question in the affirmative. An accomplished physician, Dr. Roberts, of Manchester, formerly a distinguished pupil of this school, has made carefully conducted experiments on calculi in and out of the bladder with certain results. I give you the following brief analysis of them.

Dr. Roberts finds carbonate of potash to be the most powerful solvent: better than soda, much better than lithia. The solution must not be too strong, otherwise an alkaline biurate coats the calculus and solution is checked. The best salts to administer by mouth are the citrate and the acetate, these, as you know, becoming carbonates in the urine. The adult dose should be forty or fifty grains in three or four ounces of water every three hours—equalling six drachms daily. The urine thus rendered alkaline may become cloudy from amorphous phosphates, but this state does not hinder solution, provided the urine is not also ammoniacal; but if it becomes so, it is most important to bear in mind that all solution then absolutely ceases. Hence it is useless to attempt the solution of a uric-acid stone unless the urine is naturally acid. If the urine is alkaline before commencement it is certainly ammoniacal, and no solvent will act, as mixed phosphates are deposited on the surface of the stone. He admits that it is quite useless to attempt the solution of a large calculus of any kind, or of an oxalate-of-lime calculus; and that nothing can be done with a phosphatic calculus except by the process of injecting into the bladder. Lastly, he states, alkaline *injections of* the bladder for uric-acid calculus are without efficacy. To resume: the following conditions are essential to success; certainty that the stone is of uric acid, and that it is of small size; that the urine is acid, and never ammoniacal. These extremely favourable conditions existing, the most powerful solvent known—potash—offers a fair chance of diminishing its volume considerably after a trial of several weeks, so that the nucleus may perhaps be passed by the urethra; but at present Dr. Roberts is not able to report so complete a success.[1]

There, that is the best thing that modern science has yet done towards accomplishing the dissolution of the stone. Then you say, Have there been no results whatever from the empirical methods you have described? Have miserable calculous patients for two thousand years been swallowing to no purpose all the nauseous mixtures described from Pliny to Joanna Stephens, and onwards through Chittick, with his locked cans, to the nostrum dealers of our own time? I wish to give you a fair and distinct answer to that question, and will do so as far as it is in my power.

I reply, first, that there is very slender evidence as to the complete solution of a stone in the bladder by any alkaline agent. I cannot find that any patient, certified to have stone after sounding by a competent surgeon, has, after a course of any solvent, being again sounded, or submitted to autopsy, and demonstrated to be free from stone. Less evidence than this is quite valueless. That the alkaline solutions often greatly palliate severe symptoms in some cases, and enable some patients, but by no means all, to continue in comparative comfort without extraction by any method, I have long been perfectly satisfied. I have seen some remarkable examples of their influence among those aged and very infirm persons whom it would be impossible to submit to any cutting operation, and whose calculi are not within the limits of lithotrity. Such have sometimes been enabled to spend the remainder of their lives with little or no suffering, provided that they were also enabled to maintain a condition of repose and freedom from movement. Sometimes, on the other hand, the freedom from pain which alkaline agents produce is temporary only; and in some cases, as I have not seldom seen, the effect of them is to produce considerable aggravation of the symptoms. This was often observed during the 'soap and lime-water' period. The degree of palliative influence, however, is not the subject before us, but the question of complete solution of the stone. Morand's cases, already referred to, of which twenty-two were sounded before taking the medicine, did not supply a single proved example of success. Among the alleged triumphs of the lime and potash treatment, many after death were examined and found to have stones still, often numerous and large, in the bladder.[1] But what is more to the point is, that the four persons whose cures were certified by the trustees appointed by the Government to examine into the merits of Mrs. Stephens's remedies, died, each one of them with stone in the bladder, where it was found by post-mortem examination.[2]

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[1] *The Lancet*, 1854, vol. i. p. 439.

[1] *Practical Treatise on Urinary and Renal Diseases.* 1872.

The case of Horace Walpole in the last century is well known; it was written by himself for the Royal Society. He commenced—being nearly seventy years of age—to take from half an ounce to an ounce of Alicant soap and three pints of lime-water daily for many months at a time, and with short intervals, up to the period of his death at seventy-eight. He experienced great relief after taking them for a year or so, and ultimately believed himself to be cured. At his death three smallish calculi were found in his bladder. The case naturally attracted much interest at the time, and is one of the best results on record.

But there is another curious fact in connection with this matter, which is, that the great majority of patients who took these medicines then, and who take such now, are not the subject of stone at all. They have some symptoms which resemble what they are pleased to consider calculous symptoms, and they take large doses of alkali—notoriously one of our best remedies for painful micturition from any cause—and obtain relief. They then tell their neighbours, and often certify in print, that they have been cured of that 'dangerous malady the stone.' These are the great cures which the nostrum-mongers rely upon. For what happens to those few of their clients who really have stone? Two things may happen: first, that the stone, if uric acid, becomes coated, as Dr. Roberts has described, with the biurate, which either adheres or comes away in scales; or, secondly, the urine will become ammoniacal; and thus in either case no dissolution whatever can occur. During the time, however, large quantities of white sediment composed of the earthy phosphates or of shell-like fragments of the biurate, to say nothing of the white granular deposit of the mixed phosphates, come away; all which the poor patient believes to be the débris of his stone and the proof of the efficacy of the solvent process! This fact exists in the great majority of cases, and is always appealed to as an infallible sign of the value of the agent! Meantime the stone is acquiring, not slowly, fresh layers of deposit, and is becoming surely larger. Such must often be the inevitable result where the medicines are empirically given—that is, without reference to the nature of the stone and the condition of the urine, and where the procedure cannot be watched and regulated on the principles laid down above. But, say you, this is a mere *à priori* statement, and looks very plausible, no doubt; but how do you know that this happens? I will give you one instance which will suffice, and can give more, if required. A few years ago a man came to me from Yorkshire, who, having had symptoms of stone for a considerable time, was advised to take some well-known solvent for his malady. Accordingly he did so, and you will agree with me probably that he took enough to insure it a fair trial, for he swallowed twenty-five pounds' worth of that very water which you see before you on the table. He was relieved, but his life was necessarily an active one, and he had not the means of repose and the luxurious surroundings which Horace Walpole had, and his stone symptoms ultimately got worse. At last he came to me, and I crushed for him a large mixed calculus, the greater portion of which was phosphatic. Had he come to me before it would have been a smaller one. The case did well, and the man lives at this day to tell the tale, and, if necessary, he is ready to tell it again.

Now mind, I do not say that a calculus has never been dissolved, nor that it is impossible to dissolve a small uric-acid calculus by alkaline agents taken internally. I will go further, and express my belief that, given abundance of time and careful supervision, it may be possible. Nay, I will do more; the first case of such a kind that comes into the hospital, the patient consenting, I shall be pleased to submit to the process, and to give it a fair trial. But this I say with certainty, that there is no evidence whatever that one case in a hundred of those who have swallowed solvents for the stone has been cured of it, during all past experience down to this day. No man who deliberately takes solvents for even a small calculus the characters of which have not been carefully determined, can reckon on any better chance than this—viz., that it is a hundred to one against their success, and that it is probable that his stone may grow bigger meantime. And if the stone be large, the solution is impossible.

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[1] Dr. James Parsons reports twelve post-mortems of Mrs. Stephens's patients, who, dying, were found in that condition. *A Description*, &c. London, 1742.

[2] Alston's *Lectures in the Materia Medica*, vol. i. p. 268. London, 1773. The names of these patients were Gardiner, Appleton, Norris, and Brighty.

What is the value of the treatment in question? It is impossible to say more than that it may be valuable, not for stone in the bladder, but for that earlier stage of the same malady—stone in the kidney. That is the period of its history in which to attack the stone by solvents. When small uric-acid calculi are passing periodically or occasionally, much may be done: first, and I believe mainly, by preventive treatment, on principles I have already explained to you in a lecture devoted entirely to that subject; and that being insufficient alone, secondly, by alkaline treatment. With these two together, there ought in time rarely to be much trouble with stone in the bladder. I confidently anticipate a future in which any severe operation for stone will be rare. Uric-acid stones only, as you know, are amenable to the process by solution, but, happily, they form the very large majority of renal calculi.

I must say a few words about agents to be used locally in the bladder for the solution of phosphatic stones, which are not dissolved, but rather increased by the internal remedies already described. You know that there are many patients, chiefly those who are unable to empty the bladder except by catheter, who are very prone to form calculous matter of the mixed phosphates, and this at a rapid rate. For these persons acid solutions injected into the bladder may be valuable. The patient may be taught to administer them himself; numbers have been taught in my wards. Once or twice a day, after withdrawing all the urine by catheter, he applies to the end of it a four-ounce bottle, with stop-cock, containing a solution of acetate of lead, about one-third or one-half a grain to the ounce of distilled water, or of one, two, or three minims of dilute hydrochloric acid to the ounce. He throws in half the contents, and allows it to issue, carrying out with it some small débris perhaps. He next injects the second half, and allows it to remain there. This does much to prevent the formation of phosphatic calculus, or, at all events, of the aggregation of its elements in the bladder. I have no intention to describe now at length the methods of mechanically dissolving or washing out these matters, when the above simple means are unsuccessful [more complete details in reference to this subject will be found in Lecture XIV., p. 93].

I must not omit to name the agency of electricity which has also been locally employed, both for uric-acid and for phosphatic stones. Prévost and Dumas (1823) attempted direct solution of a stone in the bladder by the galvanic current, a plan which was more fully developed here by Dr. Bence Jones (1852). The amount of instrumental manipulation, however, necessary to bring the wires into contact with the stone and to maintain them there during the period necessary for its solution is considerably greater than that required to crush the stone by the modern method of lithotrity, and must therefore be regarded at present as inapplicable.

And now comes the inevitable final conclusion—inevitable because true. It has been shown that there is no chance for the dissolution of any but a small stone, and this provided only that it exists in the most favourable circumstances: and lastly, that in order to accomplish the task a considerable period of time must be devoted to the process.

For such a stone, Gentlemen, but one brief sitting by lithotrity is necessary. And no operation in the whole range of surgery is more certainly safe, rapid, and successful. I repeat the statement, that such a case I have never lost in the whole course of my experience. Nevertheless, let the patient's voice be heard in determining the course to be pursued. He claims the right to exercise a choice, although he may not always manifest his wisdom in doing so; but it belongs to us to give him a full view of the relative merits of both methods. What they are I have endeavoured impartially to set before you.

LECTURE XIX.

ON THE FUTURE OF OPERATIVE SURGERY FOR STONE IN THE BLADDER.

(*Delivered before the Midland Medical Society at Birmingham*, November 1873.)

[After a few observations relative to the occasion of his visit and the selection of the subject, Sir Henry Thompson proceeded as follows:—]

The title I have chosen may probably, at first sight, suggest to you rather a speculative consideration of the subject than a practical one. On the contrary, I desire that my treatment of it should be wholly practical, and I hope before the conclusion of my remarks to convince you that it is so. I admit that it is not usual to commence the study of any surgical procedure by a forecast of what it may possibly become in the future. You know that at the outset of such labour one generally first wades through some epitome of the ancient authors; and that most writers commence by observing that Galen and Hippocrates alluded to the subject, or, if they did not, by equally stating that fact; and so onwards through the learned Arabians, down to the time of the Renaissance for the experience of Ambrose Paré, Richard Wiseman, and the rest; and thus finally arriving by degrees at our own era. But this method, interesting and instructive as it is, is by no means that which I intend to follow to-night. I propose distinctly a question relating to the future, and not at all to the past. I do so because I think we have arrived at a point in the history of surgical operations for stone in the bladder at which we are entitled to do that. Forecast, or prophecy—which is perhaps a rather more formidable word than I like—becomes always possible, to a greater or less extent, when we are well acquainted with the existing data belonging to, or constituting, the matter concerning which a prediction is to be made. Now, I doubt if there is any surgical subject to which this axiom better applies than that which I have chosen for discussion.

I commence then, boldly, by saying that I have come to the conclusion that stone in the bladder, like many other maladies, is an exterminable one. I believe that this grave malady, which has tested surgical skill during two thousand years and produced a ponderous literature—which has been dreaded beyond all by mankind, and has been the source of untold suffering to thousands in every age—is nevertheless a malady which may be exterminated; so far, that is, as it is a painful and dangerous one.

The greatest achievements of the healing art, throughout all time, are those which have been connected not merely with the cure but with the prevention or extermination of human maladies. You know that I can name diseases of the gravest kind which, thanks to scientific medicine, do not now exist. The plague, at all events with very slight exception, is in Europe a matter of history, and has been so for a long period. Small-pox is, at the present moment, simply an anachronism. It has no right or title to existence, and shows itself only because some people are foolish or ignorant. I will go further, and say that typhoid and other eruptive fevers are falling into the same category, and only await increased human intelligence and determination to become things of the past. And I feel sure you will agree with me that cholera must equally become subject to our control. Indeed, it is impossible that it can be otherwise. All these glorious conquests are the result of 'medical' work, conventionally so distinguished, as something differing from 'surgical' work; although I protest against this most unnatural divorce between two divisions of the healing art which never can be practised apart, as I shall hereafter have occasion incidentally to illustrate. Still, and just as naturally, 'surgery,' specially so regarded, has not found its function so much in the prevention or extermination of disease as in its cure and repair. But on this occasion I desire to claim especially for surgery, and as the result of purely surgical practice, the accomplishment of the great enterprise of preventive agency which I venture to set before you.

Before, however, I enter upon that future which I have undertaken to discuss, it is necessary first to sketch briefly the history of surgical practice relative to stone in the bladder during the present century.

Let me say, in general terms, that fifty years ago (1873), any man with a stone in his bladder could have it removed only by the knife; an operation universally allowed to be a very serious one in middle age, and at advanced age to be attended with extreme risk. About this time—that is, in the year 1824—Civiale removed from two patients, in the presence of the Academy of Paris, vesical calculi by a process of drilling and grinding them with instruments introduced through the urethra into the bladder. From that time to this, that process, generally termed lithotrity, has been developed into the now widely different and greatly improved operation which is adopted at the present time. During twenty years the development of this process was probably the cause of increased mortality among stone patients; the inevitable result of change from a system of operating elaborated by the hands of masters during many centuries, to one totally different and to which every man's hand was new. Still it lived on: men had faith in its future. Barbarous as the earlier instruments and the earlier practice might be regarded to-day—indeed, it would be really barbarous to use those instruments now—they served during a transitional period as materials to be improved by experience. And so by slow degrees the almost perfect mechanism of to-day—the light, I had almost said agile, yet powerful instrument of to-day—results, after an infinity of suggestions and many long years of trial, from the coarse, heavy, slow tools which were, partly by persuasion and much by force, introduced into the patient's bladder *me years ago. And precisely*, by equal steps, the demonstrable result by cure became better and better. Meantime those who could not perceive the value of the new method, as I quite readily conceive they might not, sought other modes of reaching the bladder by incision, which should be safe, or at any rate better adapted to the smaller stones with which lithotrity, at all events in prudent hands, alone proposed to deal. And so the bilateral, the ordinary median, or that refinement of it known as 'pre-rectal,' or some other inconsiderable deviation from the beaten track, were essayed for the purpose. Inasmuch, however, as anatomy remains the same, we can scarcely expect much improvement in the route by which the surgeon is to reach the bladder by the only two outlets at his service—either above or below the arch of the pubes. Who has not studied that great problem in silent thought at night, as well as in the dissecting-room by day? What a long line of devotees to our art have given their best energies to win, if ever so small, some tiny point of vantage ground in the perfecting of lithotomy; seeking how better to approach that canal, or avoid that vessel, or injure least that gland. And what is the verdict relative to that which is the chief among all the newer modes, as compared with the classical lateral operation? I can scarcely ask you to hear it better than from the lips of my friend, Mr. Cadge, of Norwich, who, after a careful and extended analysis of the results at Norwich of the median operation, says: 'My present experience teaches me that it is advantageous and suitable only for those patients in whom the stone is of small size. . . . Beyond this limit the path becomes thorny and dangerous,' &c.[1] This expresses the same view I have held in my lectures respecting it, and I think is receiving the general assent of surgeons who are studying the subject by comparison, and among them I include some operators of experience abroad, with whom I have recently had the advantage of conferring on this matter.

I now come to what the lithotrity of to-day is capable of performing, and before doing so I must say a word about the numerical results of calculous cases, in relation to mortality. I find that there are still some persons who persist, in connection with this subject, in presenting to public consideration numerical results in which the cases of children and of adults are indiscriminately mingled. Now, this practice is eminently misleading; and if not due to utter thoughtlessness, there can be only two causes for the usage.

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[1] *Median Lithotomy*: a paper read at the Annual Meeting of the British Medical Association, London, 1873.

It must be either from gross ignorance of the relative degrees of hazard attaching to the two sets of cases, or from an intent to mix as large a proportion as possible of children's cases with those of adults for the purpose of making a small mortality for the total. Now, in the interest of truth, or for any honest purpose whatever, it is essential to keep apart the cases of stone which occur before puberty from those which occur after that period.[1] Before puberty lithotomy is a notoriously safe operation, and at most not more than one death occurs in sixteen cases. Among adults the operation is always hazardous, so that the average results of the best lithotomists (*who treated all their cases by that method, and none by lithotrity*—a very important consideration) is about one death in every six cases from puberty to fifty-eight years; [2] and from that to eighty, about one in every three and a half cases.[3] The case of the adult furnishes a condition wholly different from the case of a boy, whose sexual organs are as yet undeveloped, and in whom no intricate and subtle sympathies between the constitution at large and the reproductive organs at present exist. It is these which, in the adult, exercise so great an influence, giving origin to the phenomena we term 'urethral fever,' sometimes grave, and which we rarely or never meet with among boys and females. Of these I say little or no more to-night. Reject then all figures in all tables in which these two classes are not clearly defined.

It is my business now to deal with stone in the adult—the largest and most important part of our subject; and in speaking of what lithotrity can do, although it is not absolutely powerless for children, being only useful for very small stones, I beg you to bear in mind it is solely a question here of stone in the adult, and that necessarily means stone in the adult of advanced age.

To pursue my subject. I place before you four trays from my cabinet, holding about two hundred calculi removed by lithotrity; the mean age of these two hundred cases is upwards of sixty years; there are very few below forty, many between seventy and eighty. To be exact, there is a tray of sixty-three rather small stones, two trays containing ninety-nine stones of middle size, and a fourth tray containing thirty-five stones of rather larger size; in all, one hundred and ninety-seven. I could have brought you many more, but these will suffice for my illustration, containing as they do several remarkable individual specimens.

Let me now consider the single question—What is the object we propose to attain in lithotrity? I answer, in brief, to reduce the stone to such small fragments that they may be easily removed; and to accomplish this object with the smallest amount of irritation possible.

We are to aim at applying force to the stone in such a manner as not to injure the delicate canal which must be traversed, and the sensitive organ, the bladder, in which it lies. And the force should be so applied that the minimum of irritation should accrue from the fragments that are made. In fact, the sources of danger in lithotrity are but two in number: injury to the soft parts by the instruments employed; and injury to those same parts from the sharp edges and angular forms of the fragments which are produced by the process. When we have reduced the mechanical action to the minimum of capability to inflict mischief, and have learned to make fragments in such a manner that they shall produce the least amount of irritation, why then we shall have arrived at perfection in lithotrity. Hence it is that I have always endeavoured to work with the fewest and most simple instruments possible, and to reject preliminary injections always, and subsequent washings-out as far as possible.[1]

How far have we solved the problem in question? I answer, perfectly, in relation to calculi of a certain size. With a calculus of certain weight and dimensions, whether of uric acid, phosphates, or oxalate of lime, say not exceeding the volume of an ordinary nut, a perfect result may be ensured. I call your attention to that tray containing sixty-three stones, and in which, let me remind you, the patients were of a mean age of over sixty years. There was not a single death among those cases. The size I name was not exceeded. And I assert that I have never yet had a death following the operation of lithotrity in which the stone was within the limits of that size. Nor have you any right to expect anything but success with such stones, requiring, say, two sittings, or perhaps three at the most, if you only take care to act with the utmost gentleness.

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[1] Cheselden speaks of the importance of always giving the age, and does so in each of the 213 cases he published. Of these, 167 were under 20. He only cut 14 persons above 50 years of age, of whom 6 died. (Cheselden's *Anatomy*, 5th edit., pp. 322-3. 1740.) Martineau's well-known run of 84 cases, with 2 deaths, contained 34 cases under 15 years of age, and 6 of females; only 12 were over 60 years. See also p. 97.

[2] A series of 528 cases.

[3] A series of 271 cases. See author's *Lithotomy and Lithotrity*, 2nd edit., p. 142.

[1] This referred to the old practice. I now use the modern aspirator as an improved mode of removing all fragments.

So far, then, is the problem solved, and triumphantly. But it is another thing when the stone much exceeds these dimensions, and where not two, but five sittings are necessary for its removal; and *à fortiori*, danger still increases when the requisite number of sittings rises to eight or ten.

In the next two trays are about a hundred stones of middle size. At this size, which is that, say, of an almond in its shell, the result is still most excellent, far superior to that of lithotomy, but not a sure success as before. Hence a certain small proportion of deaths was met with—about one in twelve or thirteen cases.

In the last tray of larger stones, the mortality was more considerable, perhaps one in eight or ten cases. With regard to some of the latter, it is quite possible that some of them would have been better cut. No man is always wise, and errors of judgment must be admitted; he is the best operator who makes the fewest, and marks well his errors, when they are made, for future guidance. After the event, also, with the fresh light of the past on the case, it is easier to know what should have been done.

Then there must always be a number of cases in which the choice of operation hangs on the slightest circumstance. There is a wide border-ground, so to speak, which is common to both operations. No man, whatever be his experience, can lay down a hard-and-fast line, and say, '*On this side* lie the circumstances which determine lithotrity, and on the other side are the circumstances which make lithotomy imperative.' The border-ground is much broader than I often like, for there is a considerable number of cases, of which it is impossible to predict which operation will be most successful: stones which are just so large as to be within the limits of size for lithotrity, occurring in healthy patients on whom three or four sittings will not tell heavily. On the other hand, the crushing of a similar stone in the sensitive patient with a worn-out nervous system, may make too large a demand on his endurance: I do not know for certain that it will do so in every given case; I only say it may; for, after all, the hale and hearty country squire, 'who has never been in bed a day in his life,' and who never ailed anything until he had a stone, often bears confinement and attacks of irritation less easily than any other patient whatever. Indeed, it is most difficult sometimes to decide; and sometimes the patient who is approached from sheer necessity, with fear and trembling for the consequences of interference, turns out the best of all, and astonishes you with his capacity for getting well.

Thus you see the only certainty of attaining success lies in getting the stone to operate on when it is small. And success being absolute then, as I think I have been able to prove beyond all manner of doubt, it follows as a matter of necessity—

> That the diagnosis of the presence of stone in the bladder, and of its size, is a matter of the highest importance.

I affirm that it is not less important to be capable of finding a stone when small and determining its size, than it is to perform the operation properly afterwards. I might almost go further, and I think I shall find you agreeing with me before I conclude, that the diagnosis I speak of is the more important matter of the two; so that I might venture to say that I should prefer, for the sake of calculous patients at large, and for the future of lithotrity, keen diagnosticians to expert handlers of the lithotrite, if I could not have both. Because, as we shall see, all progress depends on the *early* diagnosis; for when the stone is really small, no man worthy of the name of surgeon, and with a fair experience of instruments in the bladder, will fail to crush it safely. You see it is lithotrity that has made the question of diagnosis one of great importance. When there was but one mode of removing the stone—when it was necessary to cut from the perineum to the bladder for every stone, no matter how small or how large, it mattered very little whether we made an exact estimate of its size, if we only were quite certain a stone of some sort was there. What, again, did it signify whether it were mulberry, uric-acid, or phosphatic in its character? It was nothing to the lithotomist whether one stone could be crushed easily, and the other with difficulty or not at all.

Nor is there any real difficulty about making the diagnosis on which I lay so much stress. Nothing is more easy, as I shall soon have to show, if only you follow the right method. Granting me this, and the unrivalled success of lithotrity for small stones, already proved, it logically follows—

> That the operation of lithotomy must in future be rejected for all stones which are of moderate size.

Now, this is a most important fact, and it is one, I believe, which has not yet received its full consideration from the profession. For it follows, further, that all those attempts which have been made during the last fifty years, and may still be making, to perfect lithotomy for small stones are useless and obsolete. We cannot require an operation by cutting for small stones. And I am quite safe in saying that the results of that tray, containing stones from sixty-three cases of elderly adults without a death, never have been, and cannot be, equalled by any cutting operation whatever.

But it may be said that there are still some exceptional cases of small stones to which lithotrity is not applicable; such, for example, as occur in patients with narrow stricture, preventing the introduction of a lithotrite into the bladder. Perhaps there may be such, but I have not yet lived long enough to find one. During the last few years I have crushed several cases of small stone in presence of narrow stricture, and in the following manner. Nothing, as you know, is easier than to dilate temporarily any stricture if you only permit a gum catheter to remain lying in the urethra a sufficient number of days; and this is what I have done in the wards of University College Hospital with the best result. I tie in a very small catheter, and having arrived, after a few days, say at about No. 9, the patient is submitted to chloroform, the catheter withdrawn, a small lithotrite is introduced two or three times, the stone crushed, débris removed, and the catheter is replaced. In three days or so the process is repeated, and so on until all is finished. There is no difficulty in thus dealing with a small stone, however resilient be the stricture. Such cases, happily, are very rare, but when they do occur such an operation is usually preferable to lithotomy for, I repeat, a small stone.

Well, then, these matters being held as proven—lithotrity being answerable for the successful issue of all cases of stone of moderate size—it follows that there are two desiderata, and two only, to bring us to the perfect practical solution of the great question.

1. We want the best operation for the removal of large stones from the bladder.

2. We want the best method of discovering the existence of small stones in the bladder.

Now, the first I do not intend to discuss at length here; that would not be within our limits. I shall assume that for most cases the lateral operation is probably the best. It is no new question, and need not come up again here. But the second is, I declare, a new question. It may seem trite to say so, but practically, I repeat, it has engaged no one's attention at all adequately—that is, compared with its surpassing importance. I find people again and again with small stones in their bladders which have been overlooked. Not because any one is to blame for not finding them; first, because the early signs of stone, the evidence of the presence of the small stone, have not been sufficiently considered and taught; and, secondly, because the paramount importance of the discovery did not exist until the power and value of lithotrity in these cases had been demonstrated. Why, I have myself witnessed the sounding of a patient, and heard the results stated in such terms as these:—'I am glad to tell you that you have nothing considerable in your bladder; there may be a small stone perhaps; just possibly, but you have nothing considerable there, so all is well.' The patient is congratulated because he has not a stone as big as a hen's egg! But suppose there should be one the size of a bean? Why then the discovery of that stone would actually be a fact of greater importance to that man than the discovery of a big one; because, in the case of the large stone, there is but one thing that you can do, and the issue is doubtful; but find that man's stone when it is small, and you are *certain* to save him. This is a matter I cannot exaggerate the weight of. And it is by following the clue that this gives us, and no other, that we shall arrive, as we certainly shall some day, at the end I have in view—viz., the extermination of stone in the adult.

This brings us to the practical mode of looking for the stone early, and discovering its presence when small. How is this to be done?

First, respecting the mode of sounding. It is absolutely essential to employ a light sound, which can be easily turned in the bladder and urethra. Nothing but a quick and delicate movement will elicit an audible note, or produce a sense of contact, with so small a body as a pea lying in the interior of the bladder. Therefore it is better to have an instrument which will roll easily between the finger and thumb, and not require the wrist or the arm to create the movement. Hence the handle should be cylindrical, like the handle which I originally designed for my lithotrite, but smaller, and which is now much used here, and is almost universally employed abroad. The beak should be very short, so as to be turned with the utmost facility (*see* Fig. 65). To find a small stone the bladder should be empty, or nearly so. I prefer a patient to make water a few minutes before sounding, and certainly that the bladder should not be injected or prepared in any way, which only tends to defeat our object. Let him lie down, with his pelvis a little raised, and then let the instrument gently glide down the urethra; it is five to one, however small the stone may be, that it is just grazed as the beak passes through the neck of the cavity into the bladder. This sign is easily perceived if the sound is only guided lightly by the faintest touch of the finger and thumb. Held and guided by the wrist and arm so slight a graze may be unnoticed. If not felt, let the sound make two or three quick semi-rotations right and left; if still nothing found, depress the handle slightly to turn the beak below, close to the neck of the bladder, and make two or three similar movements there. That is where the stone will be found, if there is one, in the nearly empty bladder; and in the same ner a small fragment will be found at *lose of a case.*

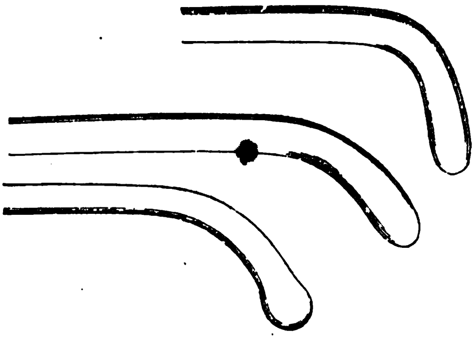

FIG. 65.—Various forms of short-beaked sound.

Now look at the sounds which were formerly used—heavy, large, with considerably curved and long ends, like those of an ordinary catheter, or nearly so. No doubt you might find a large stone with such a tool, but a small one never, except by accident. I have repeatedly demonstrated, not only here, but in the hospitals of Paris, the presence of a small calculus, or of a fragment smaller than a pea, by producing an audible note in striking it with the sound just described: then passing a lithotrite to the spot immediately afterwards, I have seized and withdrawn the bit uncrushed as proof. Pray permit me to say that I don't adduce this as any instance of fancied dexterity on my part—far from it; for you see it would defeat my very purpose to do so: it is merely an illustration of what is possible equally for you as for me, if only you pursue the rational system of seeking the small stone with an appropriate instrument. If it be not so I will sit down and give up my case in favour of lithotrity, because it is altogether a worthless operation if it is not capable of removing the whole stone. If lithotrity means only crushing a stone to pieces, and does not mean also making sure to remove the last, then by all means let us do lithotomy, and nothing else but lithotomy. Lithotrity is quite equal to its object in nineteen cases out of twenty. I do not mean to say that a case will not now and then happen in which the last fragment will not yield to our search, and may give some trouble. In all operations, however perfect, some *contretemps* may present itself. But I contend that it is very rare to miss the last piece. Seek it in an empty bladder with such a lithotrite as this; no danger whatever to the bladder exists. It is useless to seek it in four or more ounces of water, which is simply 'looking for a needle in a bottle of hay;' currents and counter-currents are produced in all that water by the opening of the blades and the action of the bladder, which keep the little bit in a state of constant movement.

Secondly, the early signs and history of vesical calculus are to be carefully noted. This brings us to what appears to me a very striking and suggestive question—How is it that the existence of a calculus in the bladder, a product almost always of slow growth, and giving abundant signs of its presence, can ever attain anything beyond a certain size without being discovered? That it does so is too true; but that it should ever grow to be of large size is to me astonishing. I assert that more than half the stones I operate upon are found in cases in which no suspicion as to the real malady has arisen until the sound has been employed. Now, with the utmost deference to others, and only after the acquirement of a profound conviction on my part, I venture to say that it is my belief that the early signs of calculus are not generally sufficiently recognised. In the whole course of my experience I have not met with more than two or three cases in which the obvious early signs of calculus were absent. To me they appear quite unmistakable. These signs may be present, or nearly all of them, when no calculus exists; but these signs being present, the sound always ought to be used. So far have we been from recognising the class which furnishes the largest proportion of calculous patients, that classical works on the subject state that stone is most prevalent in children. On the contrary, stone is uncommon in children compared with its frequency among elderly adults. I am quite aware that, in most large hospital records, half the entire number of cases are found below the age of puberty; and it is that which leads to such surprising statements about the small mortality of the lateral operation, as I have before alluded to. But then among the poor stone is comparatively frequent in children. Among the well-to-do it is very rare to find a juvenile case at all. The latter class, however, furnish it abundantly at the other end of life, and here it is that the bulk of stone cases is to be found.

And what is the ordinary or typical history of a stone case? I speak as any one, of course, may understand, of uric acid and oxalate of lime. The phosphates are mostly of local origin in a bladder incapable of emptying itself, and belong to another category. You will find a healthy-looking man with good family history as to longevity, but often tainted with gout, one or two cases of it existing, antecedently or in a collateral branch; or in its absence, some record of gravel or stone in an ancester. At middle life he finds uric acid in his urine, as a brickdust deposit, more or less persisting. Soon after a small bit of gravel passes, with or without a marked attack of renal pain; if the latter, he is at the time much relieved perhaps by medicine; but often no special treatment or regimen is adopted at this critical point in his life to check the tendency now fully developed; so, after an interval, another and another little calculus pass, and then no more for a few months; and although some suspicious symptoms appear, they are thought very lightly of, especially as the patient has not during the last nine or twelve months passed any gravel as he used to do. Whereupon he congratulates himself and is congratulated—not prudently; and the suspicious symptoms are so often attributed 'to that little weakness of the bladder which all people have as they get onwards in years.' Delusive axiom! But what are these suspicious symptoms? Not very marked, but ample to render almost certain to the experienced observer tha that interval of freedom from passi gravel only marks an advancing stage of the malady, and shows that the gravel is now too large to pass the urethra; that in the bladder is a small calculus growing by accretion, and consuming surplus uric acid for that purpose day by day. On inquiry you will find that the frequency of micturition is greater by day, during movement, than by night, during rest—condition altogether contrary to that of the 'weakness in advanced years' (prostatic hypertrophy) when the frequency is almost always greater by night than by day. You will find a slight pain—a mere passing sting—is mostly present, at the close of the act of micturition, in the end of the penis; while, on the contrary, in the 'weakness' aforesaid, the pain, if any, occurs from a distended bladder, before micturition, and is relieved by the act. Next, it will probably be ascertained that some day lately, after an unusual walk, or it may be after an hour or two in the saddle, a little blood was observed in the urine first passed afterwards; soon forgotten, or, if named to the attendant, was followed by the recommendation not to take such exercise again; but this significant sign unhappily aroused no suspicion of the true cause; so, such exercise not being taken again, the occurrence did not reappear, which again comforts everybody. Well, after listening to such a history, I am always morally certain that one or two small stones exist, and of course the sound is introduced at once, and almost invariably a small stone or more are discovered. No anxiety need arise, and the patient may now with reason be congratulated, since a small stone is certainly the safest solution of his symptoms; for, as I have already said, the malady for the most part occurs in people of otherwise good health and strong constitutions. I have no hesitation, then, in saying that from fifty-five to seventy-five years of age is the favourite term of life for the appearance of calculous diseases, at all events in this country.

I cannot ignore the fact that there are a few persons who so dread the discovery of a stone, that they will suffer almost anything before confessing their symptoms to their medical attendants. This fact is due to the popular dread of the operation as it used to be, and belongs to the traditions of lithotomy; a dread which *increased knowledge* of lithotrity and its *special applicability to small* stones will in time tend to dissipate. These persons form exceptional instances to the rule that stones may be always found when small.

I am now about to tread on delicate ground; and nothing but an absolute sense of duty drives me there. I may gravely offend some of those who hear me. I express my most sincere regret if I do so. But those who have deep convictions and are earnest in their work know full well that it is not the sole end of life to make themselves agreeable to all men. It is a sense of the importance of diagnosing the early symptoms of calculus which compels me to say that no man can properly treat diseases of the urinary organs who does not use the catheter and sound. Now, I know that it is not conventional with us at present that our brethren, the physicians, should do so. I do not say they should not. I speak of the use of these instruments for diagnostic, not for operating, purposes. The diagnosis of a urinary case very often depends on the employment of one of these two instruments, and cannot be made without it. At all events the power to use one well—that is, with gentleness and facility—when necessary, is essential to the man who would arive at a right understanding of these maladies; as essential as is a knowledge of the chemical qualities and microscopical phenomena belonging to the urine in health and disease, and without which, I take it, no modern surgeon would consider himself qualified to exercise his art. It may be said that, when the physician suspects stone in the bladder, he can always send his patient to the surgeon to be sounded. No doubt, provided only he sends him soon enough. But why this division of labour? Why does the physician use the stethoscope?—a mechanical contrivance to lengthen the ear, just as a sound is an apparatus to lengthen the finger. Who would dream of diagnosing chest disease now without the former instrument?—and why should not physicians equally send their patients to surgeons to be stethoscoped, since it is a mechanical process, and act on the report they receive? Why should the physician consider the symptoms and objective signs of a patient with urinary disease, examine the external surface with care by inspection, palpation, and percussion, and forbear to make the one most essential exploration—that of the interior? What will our children think of us and of our common sense, learning that, in this nineteenth century, it took two separate men to diagnose a case of urinary disease: one for the outside of the body and the symptoms, and another for the inside! Of course it is needless to say that I am quite indifferent to which side, medical or surgical, these maladies are conventionally consigned; but, in the interest of progress, I am much concerned that they should go to one, and to that one which can and will make a thorough and complete examination of the entire case. Otherwise, as I am too well aware, the stone will not be always found small: 'between two stools,' to use a homely proverb, the patient not seldom 'coming to the ground.'

I now think I have fairly proved that the operation of crushing the stone is safe and successful for all small stones, and I think I have also proved, or have gone far to do so, that a stone may be always found when it is small. It follows then, if you admit these things, that lithotrity must be the future operation for calculus in the adult.

It is impossible also to overlook the increasing power which an enlarged acquaintance with dietetic and therapeutic agencies—a subject which time does not permit me to consider here—not the least of which is the cultivation of abstemious habits, affords against the production of uric acid in its earliest stages; and I believe much more may be accomplished in preventing the formation of calculi by appropriate treatment at this period.

Such, then, is the future which I confidently predict in regard of that dire malady which has been the cause of so much suffering to humanity, and which has perhaps more than any other exercised the skill and courage of a great race—I had almost said of a great hereditary priesthood—of surgeons from the earliest time to the present day. I know that the accomplishment of that prediction is only a question of time and of human progress, and if we can together afford the smallest aid in hastening the era I speak of we shall not have lived in vain. For my own part I envy no man, whatever his calling, a better or a nobler purpose for his life.

LECTURE XX.

ON OPERATIVE MEANS FOR THE RELIEF OF PATIENTS SUFFERING WITH ADVANCED PROSTATIC AND SOME VESICAL DISEASES.

GENTLEMEN,—I propose to call your attention to an extremely distressing and painful form of disease, for the relief of which our resources are very inadequate. I refer to the last stage of complete or permanent obstruction existing at or about the neck of the bladder. By obstruction, I mean, to the outflow of urine by any natural efforts. In speaking of its existence 'about the neck of the bladder,' I of course exclude stricture of the urethra, which, moreover, opposes only a partial or temporary obstruction to the passage of urine. When obstruction is not only complete but permanent, disease of the prostate is mostly, but not invariably, the cause.

We have studied together the diseases of that organ, and especially that common form hypertrophy, and will not therefore go over this ground again. I will merely remind you that many individuals between fifty-five and sixty years of age begin to be unable to expel entirely the contents of the bladder. The act of micturition becomes frequent, and requires some effort for its performance; the stream grows feeble, and, under the influence of external cold, or of some diuretic action distending the bladder, or other cause, it often happens that complete or nearly complete retention is established. In such a case the bladder in the most favourable circumstances, is generally not emptied at any act; and if, immediately after an attempt to do so, a catheter be passed, a notable quantity, say from three or four to twenty ounces, may be found behind, and be drawn off by the instrument. Consequently the patient is taught to use the catheter himself, and does so periodically, say twice, three times, or more frequently, according to his necessity, in the twenty-four hours. As the patient increases in age the bladder often requires relief six, seven, or eight times per diem—a number by no means uncommon.

But in some cases, which happily are only exceptional, a more advanced stage gradually arrives, in which the capacity of the bladder is greatly diminished, so that the use of the catheter becomes necessary from sixteen to twenty-four times, or more, in the twenty-four hours. Such a condition is one of extreme misery for the patient, inasmuch as it entails loss of rest, fatigue, and often also increased difficulty in passing the instrument from injury to the urethra by frequent catheterism. At this period, too, the augmented volume of the prostate sometimes makes the canal difficult to traverse alike for the patient and the surgeon; and if a false passage be made by either at this crisis, a fatal result almost of necessity follows.

A patient in these circumstances, then, exists for little else than to pass his catheter. No sooner has he obtained a half-hour's relief than he begins to feel the approach of another act of micturition, and he experiences some minutes at least of suffering in his endeavour to postpone it as long as possible. His powers are tasked to the utmost, for continuous sleep is out of the question, and health rapidly declines. This hourly recurring task and the brief interval of rest which fall to the lot of such patients is a severe test of their powers of endurance. Their condition has often reminded me of that which constitutes the test of pluck and endurance in a well-known athletic feat—first accomplished by the famous Captain Barclay, and often repeated since—viz., that of walking 1000 several miles in 1000 consecutive hours, a task of no small magnitude; but with this wide difference—viz., that in the latter case the subject was in good health and training, knew the limits of his task, and expected a reward, whereas our patient is aged and infirm, and has small ground for hope as to the future of his trial. Indeed, 'the odds' are largely against the latter in the struggle, and without a very decided change in his condition, he must lose miserably, and with inexpressible suffering, his '*race against* time.'

The arrival of this stage, then, is the almost certain prelude of death to the patient. Hence I have naturally asked myself, having seen not a few of these cases, 'Can nothing be done, by any operative measures, for their permanent relief—if not, at all events to mitigate severe suffering?' And I think it will be admitted that, if these should be somewhat difficult or even be attended with some risk, the gravity of the situation warrants an attempt, if only a moderate chance of affording relief appears to be attainable. I say 'permanent relief,' because a temporary remedy exists for some in the employment of an inlying catheter. To tie-in an elastic or india-rubber catheter is an expedient which may avert the fatal result a little; but it can be only temporary, and it may even aggravate the malady and hasten the end. I assume, also, that medicinal agents, including especially opium, have ceased to suffice for the exigences of the case. The bladder is, indeed, so organically thickened and diminished in capacity that hourly relief has become a physical necessity.

I propose, then, as one method which may sometimes be useful in these circumstances, a proceeding similar to that which we employ in the trachea when death is imminent for want of air—viz., the introduction of a tube beyond the seat of obstruction; not as a temporary expedient, with which all surgeons are sufficiently familiar, *but to be permanently retained there as the constant channel for urine*, just as the tracheotomy tube has been for many a patient the only channel during years for air to the lungs. In other words, I propose to puncture the bladder above, or rather behind, the pubes, and to render that opening permanent for life. The proceeding which I have practised differs from ordinary puncture, and more resembles the high operation for stone, being rather a compound of the two. For, in the cases described, it must be remembered that the bladder is by no means distended with fluid, but may, indeed must be, nearly empty—a widely different condition, as regards operation, from the ordinary puncture. Moreover, the viscus is usually altered in position and largely deformed by masses of prostatic growth rising into its cavity, and sometimes even nearly filling the pelvis. I believe that puncture has never been done or recommended with this end in view—viz., to avert death by establishing a *permanent* outlet for urine when the urethra is no longer practicable through disease of the prostate and bladder. I do not overlook some interesting examples of retention of urine from stricture which were relieved by supra-pubic puncture by my friend Mr. Thomas Paget, of Leicester, and in which the tube subsequently became for years the permanent channel by which all urine passed. These operations, however, were not performed with that end in view, nor were they designed for prostatic retention at all; but it was the comfortable condition of these patients, whom I saw, which led me to think of the analogous proceeding which I now desire to put on its trial.

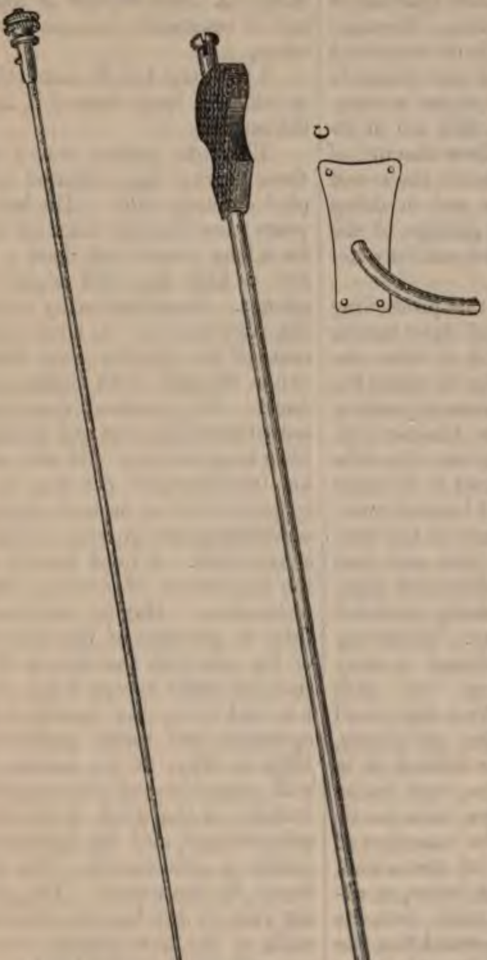

Fig. 66.—A, Hollow sound, the end of which, when stopped with the stylet (B), is introduced into the bladder, and forms the point which guides the operator in the last incision. Size about 12 or 13, English scale.
B, Bulbous-ended flexible metal stylet.
C, Supra-pubic tube of elastic gum about $2\frac{1}{2}$ in. long, with silver plate, introduced in its whole length into the sound when the stylet is removed. The withdrawal of the sound leaves the end and part of the tube in the bladder.

The operation, which I have now performed five times, consists in passing a large sound, hollow throughout, with a strongly marked curve; that represented at A in the adjoining figure (Fig. 66), I have found as good as any, but it may be modified somewhat, according to the case; and it is closed by a bulbous-ended stylet (B). The instrument is introduced by the urethra until the end can be felt just behind the symphysis pubis. It is then confided to an assistant to retain in its place. The operator now makes an incision not more than three-quarters of an inch in length, less if the patient is stout, enough to admit the index fi tightly (since a large opening becomes embarrassing subsequently), in the median line at the upper margin of the symphysis. The tissues are separated by the finger, and the linea alba being next slightly divided by the point of a bistoury, the finger is passed down closely behind the symphysis, and when the end of the sound is clearly felt, a little opening is made so as to expose its point. The operator now taking the handle of the sound in his left hand, makes the end protrude in the wound, the bulbous stylet is withdrawn, and he passes the tube (c) in its whole length into the hollow channel of the sound. He now withdraws the sound completely by the urethra, and in doing so necessarily ensures the passage of the elastic tube into the bladder, and leaves it there.

When I first designed this proceeding I used a sound with a second stylet having a sharp trocar at the end to take the place of the first, intending to make the incision for the tube by merely pushing the trocar from within the bladder outwards to the skin, after which the tube would be inserted and lodged in its place by withdrawal as above. I learned, however, by several experiments on the dead body, that although this was safe and easy of performance in a distended bladder, the peritoneum was usually wounded when the bladder was empty. Hence my abandonment of what seemed a very simple and easy proceeding. The path of safety therefore is to make a very small opening directly above the symphysis, then to find the way close behind it to the end of the sound there, and incise only just enough to allow this to be pushed up into view. The insertion of the tube into the hollow of the sound, and the withdrawal of the latter, as already stated, brings the tube into its place. But it may be remarked that the urine may not at first flow through it, for the withdrawal of the sound may carry the tube, not only into the bladder, but, when this is empty or very contracted, even through it into the prostatic urethra. If so, the tube has only to be withdrawn a little and the urine flows. Indeed, I have found that the tube is usually improved, especially in the subsequent progress of the case, by being a little shortened. It is then to be fastened securely with tapes and plaster, and to be worn a few days in bed until the parts are consolidated, and the patient can move about with safety. If the tube escapes during the first two or three days it may not be easy to replace it, but when the passage is established it may be removed and replaced easily enough. A very important injunction is to make the wound as small as possible so as to be nearly filled by the tube. A large wound is more painful, and is constantly traversed at first by the urine.

I will now briefly sketch the five cases in which I have done this, and give you the results.

The first patient was a man sixty-three years of age, admitted into this hospital January 1869. He had for several years passed all his water by catheter, and for a long period had done so every hour and a half day and night, sometimes oftener. Examination by rectum showed the existence of a large prostate, the coats of the bladder were thickened, the urine charged with inflammatory products. He remained three months, and notwithstanding rest and treatment, made little improvement. It was evident that his troubles were not due to temporary irritation, but to organic changes greatly diminishing the capacity of his bladder as a reservoir. I need hardly enlarge on the importance of carefully drawing this distinction. Having explained to him fully in presence of the class the nature of his case and the design of my operation, he gladly accepted my proposal that I should do my best to relieve him. The operation was easily performed on the 12th of May, in the manner described, with immediate relief to the patient. Unluckily, on the third or fourth night the tube escaped, and the house-surgeon was unable to introduce it. The urine issued freely by the wound. The next day, at my visit, it was but too obvious that the walls of the new passage had not been yet sufficiently consolidated to protect the surrounding parts, and that extravasation had taken place into the scrotum. I at once made free incisions and tied-in a catheter. It was a severe trial for the patient, but he came triumphantly out of it. The following six weeks, however, were occupied with this unfortunate accident and its results; meantime I had at an early period, and without difficulty, put the tube in its place, and made it fast there by tapes and plaster. A week or two after, the route was established and the tube was removed, washed, and replaced with the greatest ease every day. During the summer his health continued feeble; no catheter was necessary, the urine passing by the tube, but from insufficient attention to changing and cleaning it, phosphatic deposit formed on it, and gave much trouble. I lost sight of him in July, and he gradually failed in strength, and died in September.

The second case was that of an old and well-known medical friend, on whom in 1867 and in 1869 I had successfully operated by lithotrity. For a long period he had passed all his urine by instrument; he was now upwards of seventy-five, and had, after many years of trouble, arrived at the latest stage of frequent and painful catheterism. I was called to him in January 1870, suffering from such extreme sensibility that he dreaded passing the catheter, which was necessary twelve times in the day and night. He was clearly approaching his end, and I agreed to perform this operation solely with the view of making his last days more comfortable. Mr. Clover gave him chloroform, and I did it on February 7th. All went well; he never required the catheter again; he kept his bed, was comparatively free from suffering, and died three weeks afterwards.

The third case was probably seen by some of you here last spring. E. P——, aged fifty, was admitted to this hospital 'April 22nd, 1874, having suffered from severe symptoms four years, the last two and a half of which he has withdrawn all his urine by catheter. Of late his sufferings have been great; his catheter is passed every half-hour in the day, and he sometimes retains one for a part of the night.' The prostate was 'hard, nodulated, and enlarged'—a condition of very bad augury, occurring as it did before the age at which hypertrophy of the prostate appears. On May 7th I performed the operation described, with the view of diminishing his pains and affording him rest. It was followed by relief, especially after the first day or two, and he gained long periods of sleep, which he had not had for months before. Nine or ten days after the operation he showed signs of failing strength, and he sank on the 21st instant. The autopsy showed cancer of the prostate and part of the bladder, of the scirrhus kind—which, affecting the prostate, is very rare. The iliac glands, those about the base of the lungs, and the lungs themselves, showed the presence of the same deposit to a considerable extent. The only other authentic case on record is that reported by Mr. John Adams.[1] The word 'scirrhus' has, it should be remembered, been often erroneously used, particularly by ancient authors, to denote organs which are enlarged by ordinary hypertrophy.

Case four, T. R. C——, aged forty, consulted me for attacks of hæmaturia, the cause of which was obscure; but in April 1877, he found some small portions of solid matter in his urine, which I identified under the microscope as portions of villous tumour. He continued his business occupations in the City all the summer, although often hindered by severe pain and by hæmorrhage. Towards the end of 1877 his sufferings, his frequent micturition and inability to pass urine without a catheter, which he often required every two hours, confined him to his room; and he took very large doses of morphia by subcutaneous injection, to render life endurable. He was evidently drawing near his end, but catheterism became increasingly painful; I therefore on January 7th, 1878, opened the bladder above the pubes and introduced the small tube, Mr. Clover giving ether. This afforded considerable relief, less than in the preceding case; but it rendered the catheter unnecessary. He died on the 31st.

At the autopsy, a pedunculated villous growth was found springing from the base of the bladder. The size of this tumour was equal to that of a large walnut; it was the largest example of this kind I have seen.

Case five, H. C——, aged sixty-eight. During the last twelve years, he had consulted me occasionally relative to retained urine from hypertrophied prostate; for which I taught him about ten years ago to pass a catheter; and during the greater part of this period little or no urine has been passed by his own efforts. The last year or two his complaint has become increasingly painful, and catheterism more frequent. In February 1878, he came from Ireland to consult me in reference to this condition; and I found that he required to use the catheter sixteen times in the twenty-four hours, passing it with pain, and sometimes with much difficulty. His sufferings were great during the intervals, and his sleep almost lost at night. A soft india-rubber catheter was tied-in, but this rather aggravated than relieved his condition. Accordingly, on March 2nd, I did the operation described, Mr. Clover giving ether. This was at once followed by great relief, as he could now enjoy sleep during several consecutive hours, for the first time for one or two years at least. The appetite also improved, but he was very weak and was confined to his room. It soon appeared that his constitution was worn out, although no active disease was present. He lived about six weeks after the operation almost free from pain, gradually sinking about the middle of April.

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[1] *The Lancet*, 1833, vol. i. p. 394. I made the most careful researches several years ago in relation to this subject with the result stated above. Encephaloid cancer of the prostate is far less rare.

I have thus put the bare facts before you relative to these five cases. Little need exists for remark. In three of them at least, the second, third, and fifth, the operation was adopted solely as a last resource, to mitigate the sufferings of patients whose fate was already sealed. In the first I operated at a somewhat earlier period, with the view of prolonging and rendering more comfortable a possible year or two of life. The unfortunate accident of extravasation was too great a demand upon the resources of the patient, and, although he recovered, yet his stock of vitality was largely exhausted. We must recollect that it was the first experience, and I gathered from it useful lessons. I made the opening much smaller afterwards, have taken more care to retain the tube at first, and subsequently I should in such a case remove and wash it daily. The operation itself, properly performed, makes little or no demand on the patient's powers.

I shall now, lastly, call your attention to an operation which I have more recently adopted in some of these cases with a certain advantage; more particularly in those which have been complicated with the presence of calculus. When symptoms have not disappeared after repeated examinations by the sound and lithotrite in patients previously operated on for stone, and who have long passed all their urine by catheter, it is natural to infer that the presence of impacted calculus or of tumour may possibly be the cause of their distressing condition. I have then proceeded as follows:—The patient being placed and secured as for lithotomy, I make a median incision from the perineum, opening the urethra on a grooved staff at the membranous portion, sufficiently to admit my forefinger to pass through it into the bladder without incising the prostate. I can thus fully explore the neck of the bladder, and by making at the same time firm pressure above the pubes, I am able to reach, with the tip of my finger, the whole of the upper surface of the bladder, besides exploring the lateral walls and the fundus and trigone, the last named more completely by placing the other finger in the rectum. I have done this now in six cases: in one removing a tumour, with perfect recovery following (see Lecture XXII.); in another removing with my finger-nail an adherent scale of phosphatic calculous material: this patient, who had lost blood daily, often in considerable quantity, from that time ceased to pass any. A notable amount of improvement occurred in two cases; the other two were not benefited. In each one I permitted all the urine to flow by the wound for from six to ten days afterwards, so as to afford complete repose to the bladder and urethra, of itself a treatment of some value. Regarding these results, I cannot hesitate to believe that in a few appropriate cases this procedure will be useful. In no case has the operation been fatal, nor can it, if done with care, be considered a dangerous procedure.

You will understand, of course, that either of these operations can only be adopted as expedients to relieve when all other resources of our art have failed to do so.

LECTURE XXI.

ON CYSTITIS AND PROSTATITIS.

GENTLEMEN,—It is quite possible that you may see little or nothing, even during a considerable experience of general practice, of those diseases which have occupied our last few lectures. Some men never meet with a case of stone in the bladder during a lifetime, and of those who do, very few undertake themselves to treat it. But the very reverse of this is the case with the subject which comes before us to-day. Fraught with much less of what one calls 'interest' for an operator, its attractiveness to the student must be found in the fact that cystitis, or inflammation of the bladder, is the commonest affection of that organ, that it is certain to occur in his practice, and probably not unfrequently. For whatever else you may have to treat in connection with the urinary organs, you are certain to have cystitis. If a man has stricture severely, or disease of the kidney, or disease of the prostate, sooner or later he has cystitis, either acute or chronic, the symptoms of which are often the most prominent features in all those diseases.

Then I beg you to remember that cystitis has almost always some ascertainable cause, and that it very rarely indeed appears in what is called an idiopathic form. You will find that there is, or has been, gonorrhœa, or stricture, or disease of the prostate, or retained urine, or urine altered in character, or some other such cause; and if you have readily come to the conclusion that any case before you is 'idiopathic,' suspect that you have not discovered the cause; for the probability is that you have not searched deeply or carefully enough. Now and then, but not frequently, the true pathology of such a case may elude our best efforts. Possibly you may be forced to attribute it to a gouty diathesis. A very refuge in time of trouble for practitioners of feeble diagnostic power is gout, particularly 'suppressed gout;' therefore beware of it. And while I think it must be admitted that inflammation, either of the urethra or of the bladder, may be sometimes a mere local development of the ubiquitous influence so named, I am sure that this cause is of exceedingly rare occurrence. Certain irritant poisons also —amongst which cantharides is the most prominent and likely to be met with—occasion cystitis, which I have seen severe in character, and lasting from ten to twenty hours, as the effect of an ordinary blister.[1]

First, then, I shall call your attention to acute cystitis, and secondly, and chiefly, to chronic cystitis.

Acute cystitis appears in two very distinct forms: one severe and dangerous; the other form is much less so.

The dangerous form is that which accompanies the most severe lesions to which the bladder is exposed. The first breaking up of a large and hard stone into fragments, either spontaneously or by the lithotrite, has sometimes caused it; injury to the bladder in lithotomy and in other circumstances are causes. Rigors, bloody urine, extreme pain and irritability of the organ announce the fact, and unless the patient is soon notably relieved it is probable that he will succumb in a few days. At the autopsy the lining membrane is seen to be of a dark crimson hue throughout, or nearly so, and there are often spots where it appears to be sloughing, and the muscular fibres are exposed.

The less severe form of acute cystitis is common enough. There is reason to believe that the neck of the bladder is the part mainly affected in these cases; and the reason for this is, that what we call cystitis is often really inflammation of the prostate mainly, or of the urethra passing through it, entirely so perhaps at first, the mucous membrane of the bladder becoming affected by extension. And as, anatomically, I don't know how we can make an accurate separation of these two organs, it is often legitimate to speak of this affection as 'inflammation of the neck of the bladder.' After gonorrhœa, or from external cold and damp, and in connection with many circumstances of no apparent importance, a man becomes the subject of frequent and painful micturition, and has a sense of aching or gnawing pain above the pubes; while the urine is cloudy from an increase of the natural mucus of the bladder (not necessarily the tenacious viscid secretion, which being more common there, I shall speak of under the head of Chronic Cystitis); and there is usually some constitutional sympathy with the local inflammation, evinced by loss of appetite and feverishness.

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[1] I think it may be useful to suggest that this possibly never occurs, except where the blister is applied to a cutaneous surface which has previously been broken, or from which the epithelium has been previously removed. The only instance in which I have seen it—referred to in the text—was one in which the blister was applied over a knee-joint, the cutaneous surface of which had been previously inflamed by iodine.

I am afraid it is sometimes caused by the unnecessary and unwise use of instruments. When gonorrhœa exists, or when there is an irritable condition of urethra following it, the obvious signs of the original complaint having passed off, a patient sometimes presents himself to his surgeon, talks of difficult micturition, and of 'stricture,' of which latter perhaps there is no evidence whatever, and an instrument is passed, perhaps a little thoughtlessly, for him. It then sometimes happens, especially if the instrument was a rigid one, or not very gently passed, that a severe attack of cystitis follows. I name this as warning, for such a case sometimes is very damaging to the practitioner, as it certainly is to the patient.

The treatment of ordinary acute cystitis consists, first, in maintaining the urine at a neutral or very slightly acid reaction, by just enough alkali, in small doses, frequently repeated, to produce that effect. To all other forms of the agent I prefer the liquor potassæ. Give it in barley water, or decoction of Triticum repens. Hot hip-baths, from 100° to 108° for ten or fifteen minutes, two or three times daily, afford great relief. Laxatives for the bowels, light food, together with local poultices and anodynes if necessary; and rest in the recumbent position as far as possible. Besides these, the use of certain infusions and decoctions, of which I shall speak hereafter.

But that which most requires our attention is the chronic form of the disease. It is that which requires the most care and judgment, and for which we have most to do in the shape of treatment.

Chronic cystitis also appears in two distinct forms.

In the simpler form of chronic cystitis, there is little else than some increase of *the natural mucus from* the bladder mixed with the urine. Just as when you have a common cold there is inflammation of the mucous membrane of the nose and towards the frontal sinuses, with increase of its secretion, so the inflamed mucous membrane of the bladder adds a quantity of mucus to the urine; and the mucous membrane in this condition, being more sensitive, will not permit itself to be much extended by accumulating urine, but forces the bladder to expel it as soon as possible: hence the frequency of making water.

But, besides this, there is another form of chronic cystitis, in which the mucus has a distinct character. It is often spoken of, and not very wisely, as 'catarrh of the bladder'—another example of an unfortunate term leading to error in practice. The mucus is very tenacious, and if you empty a vessel containing the urine of such a patient, it runs off first, and then a quantity of ropy mucus follows in a mass. You may see a pint or more of this material passed in the course of the day, and it acquires the viscid character on standing. Some patients pass it for months together, and such are said, especially abroad, to have 'catarrh of the bladder,' which, and often very unnecessarily, is declared to be a very dangerous or an incurable disease. Indeed, to tell such a patient that he has 'catarrh of the bladder' generally occasions him much anxiety. Now, this is because it is commonly regarded as being an obstinate and chronic disease in itself, instead of as a symptom of some lesion, for the most part easily curable. Catarrh of the bladder is no more to be regarded as a disease than, for example, is dropsy. Formerly, you know, dropsy was talked of as a formidable malady, and it still is so to the popular mind; but no intelligent student would now, I suppose, be satisfied to think of it except as a symptom. He would say: 'What is the cause of it? Is it due to cardiac, to renal, or to hepatic disease?' Precisely so it is with this 'catarrh of the bladder.' You inquire what is the cause of it, and you will find in nine cases out of ten there is a very distinct cause, and mostly a removable one. Your investigation of a case is not to be prevented by the existence of this nosological term, 'catarrh,' so that you have only next to demand, 'What is the best treatment of "catarrh"?' but you must carry the diagnosis further, and ascertain the condition which has occasioned the symptoms. And the most common cause is one but too often overlooked, as I shall repeat—viz., inability of the bladder, either from atony of its coats or prostatic obstruction, to get rid of all the urine it contains. This peculiar muco-purulent secretion, called 'catarrhal,' is, however, by no means always present in these circumstances, and I cannot tell you here how it happens that in some cases of retained urine, otherwise apparently similar, it contains only some light flocculent mucus, and that in others there shall be a very large quantity of the characteristic tenacious matter.

With regard to the treatment, the first thing is to take care that the bladder is emptied by a catheter once, twice, or three times a day, in the easiest manner possible, as treated of in the seventh lecture (pp. 50 and 55). And this is necessary because decomposing urine is a source of great irritation to the mucous membrane. The urea contained in the secretion which enters by the ureters in a healthy state meets with stale urine and mucus in the bladder, and soon becomes decomposed into carbonate of ammonia, which salt is an acrid and irritating substance, and aggravates the already diseased mucous lining of the viscus. You explain to your patient that his bladder, not having been emptied for many months perhaps, has acquired a condition somewhat resembling that which a badly-washed utensil would have attained in like circumstances—a useful and sufficiently accurate illustration for the lay understanding—and he will appreciate it readily when he finds, as he probably will, that the mucus diminishes considerably after a few days of this treatment.

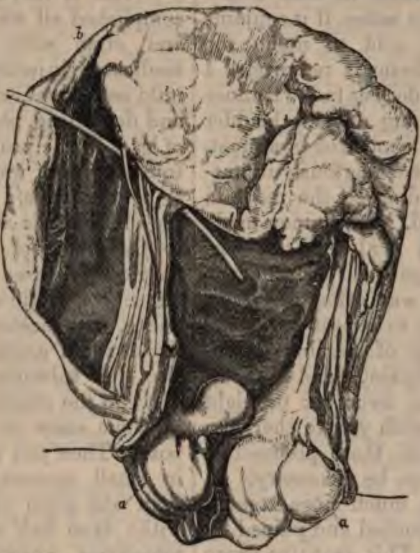

FIG. 67.—Section of bladder and prostate. A large sac of the former, marked *b*, produced by long-standing unrelieved retention of urine; a bougie lies in the small opening by which it communicated with the bladder. *a*, *a*, Enlarged prostate laid open.

But suppose it does not do so, or does so but slightly, what then? I will tell you what sometimes happens, and I am not sure that the fact I am about to ask your attention to has been observed or recorded. It is this: *you cannot completely empty every bladder with the catheter.* When the prostate is irregular in shape, and throws out protuberances into the bladder, there are sinuses or spaces between them, which retain one, two, or even more drachms of urine. Again, there are not unfrequently numerous small sacculi in the coats of the bladder which become charged with urine and act in the same way. When obstruction at the neck has existed some time, the daily straining—although not considerable—necessary to expel the urine, produces hypertrophy of the bands which form the muscular coat of the bladder. Now, you know that hydraulic pressure is equal in every direction, and in course of time the expulsive act, more powerful when obstruction is present than in health, gradually forces the mucous lining between the interlacing muscular bands, and little pouches result. In these it is not very uncommon for calculi to secrete themselves, and thus in time encysted calculus is formed. In any case, however, those pouches form receptacles for urine, which becomes stale and irritating in consequence; and not at all unfrequently they attain a large size, such an one is depicted at Fig. 67. Now, the mere withdrawal of the urine by catheter by no means empties the reservoir in these circumstances, and enough of noxious fluid is left in these pouches or sacculi to maintain the unhealthy condition of the lining membrane. What you have to do, is to wash out the bladder at least once a day with a little warm water, if it contains a trace of carbolic acid so much the better, before the catheter is removed. I am very particular indeed as to the manner of doing this. Washing out the bladder may be a very valuable mode of treatment, or a mere contrivance for seriously irritating that organ, according to the mode in which it is performed. A common mode —indeed, that which I always saw employed some years ago—was to attach to the catheter (which was often of silver, and it is unnecessary to repeat my views about the superiority of flexible instruments) a large metal syringe, and to throw in with considerable force six or eight ounces of water. I wish you to cherish a wholesome horror of that proceeding, which can in no case be necessary. A healthy bladder, and much more a tender one, can only be disturbed and pained by such a proceeding. This sensitive organ is only accustomed to be distended gradually by the continued percolation into it of urine from the kidneys. Let your washing-out conform at least in some respect to that process. Never, under these circumstances, throw in more than two ounces: and even this quantity, for efficient washing, is sometimes too large. Proceed then as follows: You have a flexible catheter in the bladder; have ready a four-ounce india-rubber bottle—with a brass nozzle and stopcock, the nozzle long and tapering, so as to fit a catheter of any size between Nos. 5 and 10—filled with warm water, say at 100° Fahr. Attach the nozzle gently to the *catheter, and throw in* slowly a fourth of *the contents; let that* run out—the fluid will be thick and dirty, no doubt; then inject another fourth, which will be less so; again another, which will return clearer than the preceding; and the fourth portion will probably come away nearly clear. Now, these four separate washings of an ounce each will have been really more efficient than two washings of four ounces each; and you will, in obedience to my never-failing injunction, have reduced the amount of instrumental irritation to a minimum. Ten to one but the patient will find the performance soothing to his feelings. There are other methods of effecting the object, but this is the *principle* I want you to understand; and the mode of carrying it out which I have described is one of the simplest.

What if this washing-out has not accomplished all we wish? We may then, and often with great advantage, try medicated injections. Perhaps the best mild astringent, when the urine is alkaline and depositing phosphates, is the acetate of lead, in the proportion of one grain to four ounces of warm water, not stronger; to be used once a day. After this comes the dilute nitric acid; one or two minims to the ounce of water; or dilute phosphoric acid, three or four minims to the ounce; or acetic acid, four minims to the ounce, with acetate of lead, and, if you like, with a grain of acetate of morphia also. A solution of tannic acid, of one grain to the ounce, is a useful astringent in some cases of abundant mucous deposit. Then you may try nitrate of silver in small quantity—certainly not more than one grain to four ounces to begin with; even half a grain to that quantity sometimes answers better, increasing gradually, if necessary, to about half a grain, or three-quarters of a grain at most, to the ounce. You may also use, especially where the urine is offensive, carbolic acid; one or two grains of the medicinal acid, Ph. B. to four ounces of water is quite strong enough. Then there is a soothing injection well worth your remembering—viz., biborate of soda and glycerine. It may be used where there is no great occasion for an astringent, or it may be combined with one. The value of this for sore mouth suggested to me its use for an irritable bladder, and experience has confirmed my expectation. Here is my formula: Two ounces of glycerine will hold in solution one ounce of biborate of soda; to this add two ounces of water.

Let this be the solution, of which you add half an ounce to four ounces of warm water. I arrange all these solutions for four ounces, because the four-ounce india-rubber injecting bottle already described is a convenient and portable instrument. Somewhat recently much has been said of the value of a solution of quinine as an injection, from one to two grains to the ounce of water, with a drop or two of acetic acid to insure solution, in presence of mucous and offensive urine. I have tried it, and cannot say that it is better than any of the above named.

In circumstances of great pain, you may inject anodynes into the bladder if you please; but they are of little value. And you need not be afraid of the quantity; for the mucous membrane of the bladder appears to have no absorbing power, unlike the neighbouring tissue which lines the rectum.[1] The latter cavity indeed, is your place for action, if spasm and pain greatly disturb the patient; a suppository of cocoa-nut butter, containing from half a grain to a grain of morphia, being often of great service. Counter-irritants play a small part among our remedies; perhaps the best and safest is a hot linseed poultice, well sprinkled with strong flour of mustard, above the pubes. I cannot recommend croton oil, or nitrate of silver, as counter-irritants there. Hot fomentations, in the form of bran or sand-bags, hot flannels, &c., alleviate pain materially; so also do hot hip-baths and the hot bidet.

Then there is a host of infusions and decoctions reputed to exercise a beneficial influence in cystitis. I will name some of them in what I think to be about the order of their value for the cases one commonly meets with: Buchu, Triticum repens, Alchimella arvensis, Pareira brava, and Uva ursi. Now, for the doses of these, your conventional tablespoonful is a miserably inefficient measure. Of the first, fourth, and fifth, give half a pint daily; of the second and third, a pint, that is, of their infusions or decoctions, as the case may be.

The underground stem of the Triticum repens, or common couch grass, was introduced some years ago by myself. Of this I will only say that it maintains its credit, and is undoubtedly very useful in many cases. For use, boil slowly from two to four ounces in a quart of water until reduced to a pint; the strained liquor to be taken by the patient in four doses in the twenty-four hours. It was a favourite remedy in the old herbals; and it formed the staple medicine against what was called 'strangury,' which, a few centuries ago, meant everything like pain or difficulty in making water, no matter what the cause; for the art of diagnosis was then in its earliest infancy. The 'Parsley piert' (derived from 'percer la pierre,' and not a parsley or umbelliferous plant at all), or Alchimella arvensis, has proved in my experience an admirable remedy in obscure cases. Use it as an infusion: one ounce to the pint. Buchu, Pareira brava, and Uva ursi are as you know officinal in the British Pharmacopœia: the first seems to act by reason of the volatile oil it contains, which, by the way, makes it often disagree with a delicate stomach, in which case do not continue to administer it. In any case, Buchu should not be given for any long period of time. The other two agents may be taken for several weeks if necessary; but they cannot be regarded as valuable remedies. Besides these there are the resins, which have a certain amount of influence upon the mucous membrane of the bladder; such, for instance, as copaiba, sandalwood oil, Venice turpentine, &c. You should not, however, give the dose which you would give in gonorrhœa. Five minims of copaiba, three or four times a day, in mucilage, is sometimes useful. I may say the same of the oil of cubebs.

One word about alkalies. As a rule, no doubt, alkalies, in neutralising acid urine, greatly help to control chronic cystitis; and I prefer the liquor potassæ, to the bicarbonates, tartrates, and citrates, which appear to have more diuretic action and to increase the quantity of urine action you would rather avoid, so as to lessen the frequency of micturition. The old combination of liquor potassæ and henbane, affirmed to be a union of incompatibles, nevertheless seems to me one of the most valuable forms in practice. It is affirmed on high authority that both hyoscyamus and belladonna are deprived of certain specific qualities when mixed with liquor potassæ. Chemical changes undoubtedly are thus produced. But I am perfectly satisfied that this combination materially controls painful and frequent micturition in the complaint we are considering. Hence I have continued to employ it, and for the reason stated.

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[1] Some one thought proper to question, in one of the journals, the accuracy of this statement relative to the effect of narcotic injections into the bladder, and even to caution my readers against relying on me too implicitly. It might have seemed otherwise almost unnecessary to say, that this particular statement presented the result of very numerous experiments and observations; and its object was of course to show that such injections were of small service, and, therefore, not to be recommended. My only reply to the critic was to inject *four drachms* of Liq. opii sed. into the bladder of a patient with chronic cystitis, in one of my wards in Univ. Coll. Hospital, on four separate occasions, in presence of the students, who verified for themselves the absence of any sign of the presence of opium in the system. Subsequently, a dose (*by mouth*) of twenty minims for the same man, produced *notable* contraction of the pupil.

Now as to acids. Remember that these are by no means the complement of alkalies in relation to their influence on urine. Beware of the current notion that it is possible to produce an acid reaction on urine by giving mineral acids by the mouth. By giving alkalies, you can make the urine neutral or alkaline to any extent you please, but you cannot do the converse with these acids. Yet I constantly hear it said, 'The patient's urine is very alkaline; had we not better order acids?' The reply might be, 'By all means; give an ounce daily, if you like, but it will not change the reaction of the urine.' I have given that very quantity, greatly diluted, of course, without the slightest effect on alkaline urine. No doubt mineral acids are sometimes useful 'tonics,' and may do some good; but don't prescribe them with the view of directly acting on the urine. The acids that do act on the urine are benzoic acid and citric acid, but you have to give so much of these that I do not know whether the remedy may not cause discomforts equal to those which arise from the disease. The benzoic acid has also some balsamic character, and is doubtless useful in some cases of chronic cystitis. The best way to give it is in pills, as it is not soluble in water. Three or four grains, with one drop of glycerine, is a good form; and you must give as many as ten or twelve pills a day to attain a good result. At all events, it is useless to give less than six; that would be twenty-four grains in the day. Lemon-juice has also an acid influence on the urine, and if it agrees with the stomach, may be taken in large quantity. But here is the *important fact for you to* remember: Surplus *of acid in the urine is* a constitutional error, and it enters the urinary passages at the kidney. It requires constitutional treatment, that is, of the digestive rather than of the excretory organs, and mere alkaline treatment does but neutralise and mask the acid—does not prevent its production. You have to remodel the patient's habits, control his diet, and take care that his liver and bowels act freely. On the other hand, persistent alkali in the urine is, in nineteen cases out of twenty, a *local* formation in the bladder. If you take pains to get a specimen of the urine direct from the kidney before its alteration in the bladder, you will mostly find it acid. Such alkaline urine requires local treatment, as by catheter and injecting-bottle, and not physic. Now and then you meet with neutral or alkaline urine, milky-looking, with amorphous phosphates, as a constitutional condition; but this occurrence is rare in comparison with the cases I am now describing.

Before quitting the subject of cystitis, let me say it is important for you to know that this affection appears sometimes to originate by contagion—through the employment of instruments not properly cleaned. Happily the outward flow of urine through a catheter prevents what might otherwise be a frequent means of conveying infectious matter to the bladder. To avoid this danger, all flexible instruments should be placed in a bath of water containing a little carbolic acid: and all metallic instruments should be plunged into boiling water for a few seconds. All should be lubricated on every occasion with olive oil, in which have been dissolved ten grains of carbolic acid to the ounce; a combination which is wholly unirritating to the urethra.

It is quite common for human urine to be loaded with bacteria, as it comes from the bladder; and it has been even supposed by some persons, that the presence of the bacteria is a common cause of cystitis, and that the proper treatment consists in septic injections to get rid of them. I think I can confidently say, there is not the smallest foundation in fact for that theory. Almost all urine in chronic cystitis contains bacteria; I have seen them in the freshly-passed urine of an individual who has never had a catheter passed into his bladder; for it has been naturally supposed that catheterism is the means which leads to their production in that cavity. Whether that be so or not, I think it wise to add a trace of carbolic acid, to almost all the injections used for it, as a matter of precaution.

I shall close this lecture with some brief remarks on acute and chronic prostatitis.

Acute prostatitis occurs in different degrees of severity, and often comes first before the practitioner's notice when it causes retention of urine by obstructing the neck of the bladder. How this emergency is to be met I have described at some length in the ninth lecture (page 58). The organ is usually considerably swollen and very tender; besides this, the inflammation may sometimes give rise to abscess in the substance of the gland, or adjacent to it; and the matter may burst either into the urethra, its most common course, or into the rectum.

Chronic inflammation of the urethra, passing through the prostate, and more or less affecting the prostate itself, is a condition less generally known or recognised. Nevertheless, it is a common and important affection. We see it frequently, but not invariably, as the result of obstinate gonorrhœa. I have already referred to it as the cause of symptoms resembling, more than any other malady, those of calculus in the bladder when mild in degree. Thus a patient of twenty or thirty years of age tells you that the following symptoms have rather gradually appeared:—Undue frequency of micturition; pain following the act, and felt in the end of the penis; occasionally a little blood seen with the last few drops of urine, which may be somewhat cloudy with muco-purulent deposit; a sense of heat and weight in the perineum and rectum; there is, perhaps, also some gleety discharge in the urethra. All these conditions are aggravated by exercise. You see he gives you a complete sketch of the early symptoms of calculus; and how are you to distinguish them? By the history and by sounding. Thus, there is no history of the descent of calculus from the kidney, nor of gravel previously passed. But there is the fact of a chronic gonorrhœa resisting, perhaps, months of treatment. And if the patient shows no improvement, you must not decline to sound him. You do so, then, if really doubtful as to the nature of the case—not otherwise—and will find nothing, but that the prostatic urethra is very sensitive, and you make him worse, perhaps, for a day or two. Therefore avoid the process, unless you are really in doubt whether the symptoms are not due to stone.

What is to be done? First and foremost, as a rule, having thus settled the question, abjure all instruments, which, in most cases can only do mischief. Treat it as you would a chronic inflammation of the ear or eye—*i.e.*, blister an adjacent surface; make a small blister every four or five days on either side of the raphé of the perineum, by applying with a brush the liq. epispast. of the British Pharmacopœia (a solution of Cantharides in ether), not so freely as to distress him or prevent locomotion, and continue the plan for four or six weeks. I have found the best results from this method, combined with a tonic medicine and regimen; and you will find the patient himself gladly exchanging the dull weary aching in the perineum for the smart of the blister, and cheerfully noticing how the former gradually subsides under the influence of the latter. In exceptional cases—and these really belong to another class, those in which constant chronic gleet is a prominent symptom—the application of a solution of nitrate of silver, not more than one to five grains to the ounce of water, to the prostatic urethra, may be very serviceable, if applied with care and all the gentleness you are master of, by means of an instrument fitted for the purpose.

I shall in my next lecture proceed with diseases of the bladder.

LECTURE XXII.

DISEASES OF THE BLADDER: PARALYSIS; ATONY; JUVENILE INCONTINENCE; TUMOURS.

GENTLEMEN,—Two patients have been recently admitted to my ward, and both were affirmed to have 'paralysis of the bladder;' such, at least, is the statement that accompanied them here. On examining one of them, we found a not unhealthy-looking elderly labouring man, from whom, by much questioning, we elicited the following facts: That he is nearly sixty years of age; that he has passed his water much too frequently for four or five years; that he was much disturbed at night to do it, although lately it has come away without his knowledge during sleep; that when he makes an effort at work the same thing often happens; that the stream is weak, falling almost perpendicularly; that he has 'no particular pains,' but is not so strong as formerly, having become weaker of late; and that for the last few months the urine has been cloudy, and has had a disagreeable smell. With all this his ordinary functions had been fairly performed, and he had followed his daily labour until three weeks ago.

The man was desired to unfasten his dress; as he did so you remarked a urinous odour, and that certain cloths, which did duty for an india-rubber receptacle—a luxury beyond the means of our patient—were wet with the secretion. Two conditions only could cause this unhappy state of things: either the bladder was incapable of performing its office as a reservoir, and permitted the urine to escape as fast as it entered from the ureters; or the viscus was unable to expel its contents, so that it was over-distended by them, the surplus oozing out, or being forced out, in the manner described.

Now, a glance of the eye might have nearly sufficed to settle this question. I pointed out a marked protuberance above the pubic symphysis; and after placing the patient on his back, the dulness by percussion corresponding with that spot, and the clear bowel-note all round, diminished the doubt that this was a collection of fluid, if any such doubt yet existed. Still this was not quite all that t was necessary to know; it was just ssible that the swelling might be a solid tumour of the bladder, occupying its proper space and much more, and so destroying its function as a reservoir. To the hand, however, the protuberance was clearly made up of fluid; but even an opinion so formed falls short of absolute demonstration, for the most practised hand has been known sometimes to 'lose its cunning,' or to have found a too deceptive quality in the object handled. Finally, you saw that a well-curved gum catheter glided into the bladder, and that upwards of 40 ozs. of somewhat stale urine flowed off. I then examined the prostate, and found no very obvious enlargement.

Now, was this a case of 'paralysis of the bladder'? Certainly not. The history of the patient showed that he had had no seizure of any kind, and I beg you to understand that without some change in a nervous centre there is no paralysis of the bladder. Recall, if you please, what I said in my seventh lecture (p. 48) on this subject. This term is applied, or rather misapplied, every day to such cases as the one before us, and with the result not merely of masking the true pathological state, which ought always, if possible, to be indicated by a nosological term, but of misleading the inquirer, since it indicates a condition which by no means exists.

What, then, is the defect or disease occasioning the symptoms in this case? Probably, atony of the bladder. I will speak presently with more precision. The bladder fails to expel its contents in the two following conditions: either a growth from the prostate, by no means necessarily large, obstructs the neck, so that the natural power of a healthy bladder—or even of one reinforced against the obstruction by hypertrophy—cannot propel the urine by or over the enlargement into the urethra; or, no prostatic obstruction being present, these muscular fibres of the bladder have become so enfeebled, or even atrophied, that their propelling power is lost or greatly diminished, and the organ is merely a thin flaccid bag, unable to exercise expulsive force upon its contents.

The two conditions, hypertrophied prostate and atonied bladder, naturally, often coincide. While hypertrophy of the bladder more commonly takes place in connection with obstruction caused by urethral stricture; it also sometimes accompanies enlargement of the prostate. On the other hand, the latter condition, prostatic obstruction, is frequently associated with thinning, dilatation, and atony of the coats of the bladder. But atony may be sometimes produced when there is no disease of the prostate, and then mainly from the subject of it having been placed in circumstances which obliged him to retain his urine for a too considerable period, so that the bladder became over-distended, and has failed subsequently to regain its tone. Unfortunately, a single error of this kind will sometimes produce an atony, which becomes irremediable if discovered too late.

Now, on further questioning our patient, we did not find that he could recall any such instance, or that he had ever formed the habit of permitting such over-distention. Neither did the affection occur suddenly; on the contrary, the symptoms appeared gradually. What is still more significant is, that they occurred at that time of life when prostatic hypertrophy mostly commences, if it appears at all. Still, the prostate was not obviously large on examination by the bowel. We arrive, then, at the following conclusions:—That this man has some enlargement of the prostate, which, though not obvious in the rectum, consists in a small nipple-like projection of the median portion, occluding the neck of the bladder, and that, from the size of the bladder, as just now demonstrated by percussion and by its contents, its walls are thin, and have lost their contractile power; in other words, are in a condition of atony.

I think there is no escape from these conclusions, and I beg that you will not only never permit yourselves to allude to this condition as 'paralysis,' but that you will protest against so loose and improper a use of the term when you hear it thus applied by others. Now, true paralysis of the bladder occurs from injury to the spine, and also as one of that large group of symptoms which results from disease in the cerebral or cerebro-spinal centres. You will then probably find it associated with impaired power of movement or an unsteady gait, with defective articulation, or with some of the slighter signs of such central mischief, as well as with those which are more obvious; and I have even found it persisting after all other signs have nearly—I cannot say quite—disappeared.

In all cases, as in that of this patient in the ward, it is essential to empty the bladder by means of the gum catheter three or four times daily, to remove the urine completely, and at least to afford the muscular coat a possibility of re-acquiring power, which does not exist so long as that coat remains constantly distended by the retained urine.

Next, for the treatment of pure atony and for slight paralysis, uncomplicated with prostatic enlargement, a little aid may be sometimes afforded to the patient through the agency of electricity, by cold douches and injections, and by tonics; but less advantage is to be derived from these remedies, in my opinion, than some have appeared to believe, although I by no means say they are not sometimes serviceable. I have seen an increase of expulsive power attained rapidly during the daily application of an electro-magnetic current to the bladder, made in the following manner:—To one pole the ordinary handle and moist sponge are attached, which is placed over the lumbar vertebræ; an elastic bougie, containing a conducting wire, and tipped with metal, is attached to the other pole, and is introduced into the bladder. A weak current is set going, and its effects watched, as at first a slight sensation only is to be produced. This accomplished, you should move the bougie about gently in contact with the walls of the bladder, the urine having been just withdrawn; and, finally, let it rest a little in the neck of the bladder, where greater discomfort is felt: in all, allowing the current to pass for eight or ten minutes before withdrawing. In no case is any notable irritation to be produced by this agent.

A very different condition from that just described sometimes results after severe local injury to the bladder—viz., inability on the part of the organ to act in any way as a reservoir. In this unfortunate situation the urine leaves the organ by the urethra as fast as it enters by the ureters. This is complete incontinence, in the true sense of the term. Little else than mechanical contrivances are of any avail. And these consist of making an artificial reservoir of some kind, mostly of india-rubber, outside instead of inside the body; one which can be emptied at the patient's will. Happily, such cases are very rare.

But there is a partial incontinence which is very common, and which is, moreover, amenable to treatment. You will be consulted by an anxious mother who, bringing her boy or a girl, of any age below puberty, and occasionally above that period, tells you that every night, or nearly so, this young person wets the bed. Examples of this are frequently seen in my out-patient room. You know that, in a child with a busy, excitable brain, muscular movements occur during sleep of a much more active character than those which usually occur in the adult, or in children of a more placid temperament. Anything up to somnambulism may take place during sleep in a child whose physique is weak, and who is the subject of a restless, ceaseless activity of mind; and micturition during sleep often occurs in connection with this state. Clearly, however, not only in such cases; for in some very dull and stupid children, in whom intelligence appears to be below the average, the same thing may happen. And it must also be admitted that there are cases which do not fall into either of these classes. For the cure of these unfortunate patients all sorts of remedies and all kinds of management are adopted, including even a periodical employment of the birch—a species of 'cytisus' which I trust you will never admit into your own therapeutic scheme. Depend upon it that 'punishment' for this form of youthful frailty will not answer; and whatever of strength to the moral faculty may be communicated in obedience to the ancient injunction not to spare the rod—a question beyond our province to discuss—do not regard it as binding on us who practice the healing art. The child's attendants often lose patience at the perpetual recurrence of the disagreeable infirmity, and believe it to be the result of wilfulness or of carelessness. I have seen much cruelty practised, even by the nearest relatives of these unhappy offenders. Give it no countenance whatever.

Now for treatment, to be considered briefly, and as much as I can on general principles. For class the first, you will ultivate the physical side of life; remove *much as possible the* sources of over-mental stimulation; strengthen the constitution through the agency of diet, country air, or sea-bathing, if possible, and give steel-wine and cod-liver oil. For class the second—those of torpid and deficient intelligence—you must show the importance of developing mind. Endeavour to call the will into play as much as possible, and enlist it to aid you in preventing the act. These are the children who are usually ill-treated, and often made worse in consequence; instead of which they are rather to be made sensible of the importance of losing the habit, so as to get a stimulus for volition in relation to it. Here remedies which act specifically on the organs are most appropriate; although these agents are useful in both classes.

First and chiefest is belladonna; which apparently paralyses the expulsive muscles of the bladder and the sensitiveness of the organ at the same time. Thus, in elderly people, who have feeble power to expel the urine, a dose often produces complete retention, lasting occasionally some time, and unaccompanied at first by consciousness of inconvenience from it. To these young patients you should give small doses, at first, of the tincture, in the afternoon and at bedtime, increasing them gradually to a considerable extent, if necessary, until the influence of the drug is quite manifest. If thus the bladder is made to retain the urine all night for a time, a new habit is formed in place of the old one, and it is probable that retaining power will persist on discontinuing the medicine, which, however, should be done by degrees. This remedy is so excellent a one that it has almost superseded blisters to the sacrum and such counter-irritants. After it, nux vomica may be tried. A combination with belladonna of strychnia, say 1-48 to 1-36 of a grain, has succeeded with me after failure by the latter alone. Then, for confirmed cases, after the failure of other treatment, especially for those who have arrived at puberty, or thereabouts, a mild caustic solution to the prostatic urethra—say ten grains to the ounce of water—has answered in my hands; to be repeated with a stronger solution if necessary. This for either sex; but I have found for boys the frequent passing of a soft bougie, which is left in the urethra for two or three minutes at a time, suffice to arrest the habit. When the prepuce is very long and cannot be easily retracted, a complete circumcision should be performed.

In all cases inquire carefully for derangements of digestion, in all its stages, from primary stomach symptoms to worms in the lower bowel—not unfruitful in their adverse influence. Of course you will take care that the child has not too much fluid, either in the form of beer or of tea, nor partakes largely of solid food containing much water in its composition, during the latter third of the day; and that it is taken up to pass water late in the evening, when the attendant goes to bed.

A short sketch of Tumours proper to the bladder and prostate will finish this part of our subject. First, you are distinctly to understand that all those outgrowths from the prostate which really come under the head of hypertrophy, since they are more or less composed of structure identical with, or very similar to, the tissues of the organ itself, however much the outgrowths may project into the cavity of the bladder, are not to be included in the class of vesical tumours; although it is not an uncommon error to confound such prostatic products with the above-named growths.

Tumours proper to the bladder are of rare occurrence. I wish you to know what they are—what it is possible you may meet with, so that you may have the chance of recognising an example if it falls in your way. As with those in other parts of the body, they are classified according to the amount of force which they manifest to invade surrounding structures, or to reproduce themselves elsewhere.

Thus, first, we have simple fibrous growths, chiefly in the form of polypi, springing from the walls of the bladder, and wholly unassociated with the prostate; the rarest of all forms—in short, exceedingly rare, known to me personally only by three or four specimens in museums. There are, very rarely, also some formations so small as to be merely mucous papillomata, consisting of little outgrowths from the mucous membrane only.

Secondly, there is the 'villous or vascular tumour' of the bladder, miscalled 'villous cancer;' for I have no hesitation in saying that the villous growth has no invading or reproductive power beyond the organ in which it arises, although the contrary has been alleged. This perhaps is the most common form in adults. Its appearance after death, when rather fully developed, is something like that of a small strawberry, and more than one, especially if the case is long continued, may exist in the same bladder. I have seen one example as large as a chestnut and pedunculated.

Thirdly, there is epithelioma—the lowest type of malignant formation, and the slowest of development.

Fourthly, true scirrhus occurs in the walls of the bladder; it is more common than the preceding, and nearly as much so as the villous tumour. Encephaloid cancer sometimes is met with, but very rarely.

Respecting the prostate, it may suffice to say here that the tumour to which it is chiefly subject, the tumour-form of hypertrophy put aside (*vide* pp. 45–6), is a malignant tumour, and that of the encephaloid variety. True scirrhus is so rare that I have seen but one case in my life, and know but of two others besides that. There are no examples in any of the museums. Common hypertrophy has often been termed 'scirrhus' in error.

Now, putting the first form of vesical tumour, or polypus, out of the question, it may be said in general terms of all the rest, that the single and most certain characteristic of the presence of a tumour is *persistent vesical hæmaturia*, no calculus or other obvious cause existing.

But never arrive hastily at the conclusion in your own mind, nor even too readily admit the suspicion, that tumour is present: for you will remember, in the first place, that it is exceedingly rare, compared with other causes of similar symptoms; and, secondly, that there are no early positive signs, or almost none which can be so regarded, of its existence. It is only by a long process, and after much careful watching of any case, and consequently when the disease is in a somewhat advanced stage of development, that you can, and mainly *per viam exclusionis*, conclude with some reason that a tumour is present.

The symptoms of vesical tumour are almost identical with those of calculus, and the patient is certain to be sounded more than once or twice before tumour is even suspected. Suppose, then, that you have verified the absence of stricture, of prostatic enlargement, of chronic retention of urine, of calculus, of primary renal disease.

and you are at a loss to know why your patient passes water with great frequency and pain, the secretion containing more or less muco-pus, and having blood in it often or continuously, the quantity of which is increased by exercise—you direct your inquiries to the existence of vesical tumour. And you will proceed thus: First you will introduce your finger into the rectum and ascertain whether there is manifest hardness and thickening in the situation of the bladder: especially you will note if any deposit so found has a hard or knotted feel, and irregular outline, running back, perhaps, beyond the prostate. If these characters are obvious, you have almost certainly a case of scirrhus to deal with. You may further, if in doubt, introduce into the bladder the short-beaked sound, and with the finger in the rectum carefully explore the thickness of the structures intervening between the finger and the sound. Next, the sound being still in the bladder, or the finger being placed in the rectum, you will not find much difficulty, provided the patient is thin, in gaining some information of a like kind by palpation above and deep pressure behind the pubic symphysis. Then, by movements of the sound itself, you may be able to detect a hard mass of scirrhus on either side of the vesical walls, the sound not turning over readily to the left or right, as the case may be. You will not discover a villous tumour thus, for it is much too soft, and will elude the most delicate traversing of the cavity which can be achieved. Even an epithelial growth, which is usually wide in its base, of flocculent surface, and sprouting into the cavity, although not very luxuriantly, is so deficient in induration as not to be readily discoverable. It scarcely destroys the flexibility of the vesical coats, which is the fact you have to ascertain.

In nine cases out of ten you will, as the case advances, discover by rectal examination a mass in the bowel, not globular and homogeneous in density, like most hypertrophies of the prostate, but a dense, knotted, or irregularly formed tumour, by no means symmetrically placed, and extending far back, often beyond the power of the finger to define. Inequality in surface as you explore it, and unevenness in texture, while it is for the most part hard nd unyielding to pressure, are the charac- s *which* will compel you to form the *vest conclusion as to the* nature of the growth. Most rarely, the tumour is at the apex of the bladder, and beyond our reach in the bowel. Almost invariably is that portion of the bladder involved which can be touched by the finger. I have lately verified the fact of exception in one case, and therefore record it.

You may find also by searching laterally within the bowel, or externally in the groin and iliac regions some indurated glands, but they are palpable only in advanced cases of scirrhus; and you may also obtain such light on the subject as a search for cancerous growths in other parts of the body may afford you. Thus, not long ago, I had my diagnosis of cancer of the bladder in the case of an elderly patient made certain by the appearance of a secondary growth, springing from the cranium.

Again, you will repeatedly and carefully examine the deposits in the urine for the appearance of organic materials cast off from the growth, which may serve to indicate its nature. Thus I have detected under the microscope the peculiar structure which the processes of the villous tumour present to the eye. But what of the cells of epithelioma, and what of 'cancer-cells'? I am compelled to resign to others—and I am well aware that several writers on this subject have proclaimed the value of microscopic examination of the urine in vesical cancer—the good fortune of absolutely identifying malignant disease by this means. First, suppose you have caught your 'cancer-cell,' are you prepared to swear to its identity? As students, I will assume you have examined, say a few hundred specimens of urine, not many, but enough, at all events, for my purpose, and that you have, therefore, not a little perplexed yourselves, if you are of an inquiring turn, with all that fruitful progeny of cells, epithelium of different parts and in all stages of growth, &c., which are desquamated in health, but especially under the influence of any morbid action in those passages, and which appear therefore in the urine. Some of the best 'cancer-cells' I ever saw in my life were collected from a patient's urine, and placed under the microscope by a practised microscopic observer, for the purposes of a very important consultation, at which I assisted. After a careful local and general examination of the patient, and due observation of the very complete microscopic illustration, I was compelled on general grounds to doubt the existence of cancer in the bladder; and the ultimate result, happily for the patient, confirmed that view, and disproved the cell. Most valuable as is the microscope in this great class of maladies—ranking next, and very near to, the sound itself—never let it obscure for you those broad features of the case which are to be determined by the unassisted eye and touch, as applied to the body, and to the urinary secretion itself through the means of reagents. But when you find, as sometimes happens, distinct masses of soft, almost semi-translucent structure of considerable size, passed by the urethra at micturition, and discover on examination that these evidently consist of rapidly-formed cell growth, the cells of large dimensions, and containing two or three nuclei, the observation will go far to confirm your suspicions of cancer aroused by pre-existing symptoms.

Lastly, you will, in endeavouring to determine the particular kind of growth, observe the nature of the hæmorrhage and the character of the pain. In malignant disease, the hæmorrhage is irregular in its occurrence, long intervals being sometimes observed in which no bleeding appears; and when it does take place it is often in considerable quantity, and it may persist for some time; moreover, the blood is usually of a florid colour. In villous growths the urine is generally more persistently coloured, and presents a reddish tint, resembling the juice of raw meat, although there may be intervals without the tint; but it is rarely dark or smoky in hue; occasionally, however, considerable hæmorrhage takes place. The pain of cancer is more constant and severe than that of villous growth, the latter not being necessarily accompanied with great pain, unless obstruction to the outflow of urine is produced by the tumour.

One important and unmistakable symptom of malignant disease is always present in these cases—viz., large and often rapid loss of weight by the patient. If this is not present in a doubtful case I can afford to take generally a hopeful view: if, on the contrary, it is manifest, the case is graver.

What shall I say here respecting the treatment of vesical tumour? It must be regarded from two points of view: first, as palliative in its object, in relation to the existence or predominance of certain symptoms, which may be regarded as three in number: hæmorrhage; painful and frequent micturition; retention of urine.

Secondly, in relation to the question of extirpation by some operative measures.

For the treatment of hæmorrhage, I shall first name the internal astringents, I mean those administered by the mouth, as gallic and tannic acids and the acetate of lead, for which I have little to say by way of commendation. The agents which have been most valuable in my experience are alum, iron alum, and an infusion of matico—of these the alums have been associated with the best results; you may give from ten to fifteen grains of either three times a day, with ten, fifteen, or twenty minims of sulphuric acid, adding syrup to make it palatable; and it certainly is so, and does not generally derange the stomach at all, which cannot be said of gallic acid or of lead. Of the infusion of matico, not less than two ounces should be taken every three or four hours if bleeding is considerable.

For the local treatment of vesical hæmorrhage, when it is chronic and constant, I know of nothing so good as injections into the bladder of nitrate of silver, commencing with one grain to four ounces of distilled water, most gently and carefully used, for it is almost unnecessary to state that by such local treatment, if your handling is rough, it is very easy to increase the bleeding. You may throw in an injection daily, in the manner before described (page 148), permitting an ounce to remain when the catheter is withdrawn: and the quantity may be augmented gradually as far as to one grain to the ounce, provided that undue pain is not caused. Few can bear this quantity without considerable uneasiness, and this sign of its action should, I think, be reached if the bleeding remains still unchecked. When hæmorrhage is considerable, absolute rest in bed, cold applications, and avoidance of instrumental interference, unless absolute retention renders it necessary, are the main additional elements of treatment. If instruments are really necessary to withdraw blood and urine, then the slow injection of iced water, or better still, of iced infusion of matico, may be useful. A solution of the tincture of the perchloride of iron as a cold injection I have known in more than one case to succeed when all others have failed. The proportion is from thirty minims to a drachm of the tincture to four ounces of water.

For alleviation of pain or frequency of micturition do not spare opiates—trying any form, or all forms in turn, until you find that which most assuages it and least disturbs the digestive organs. Give them by mouth, subcutaneously, or by suppository. Never mind how much, in order to act efficiently. It is not a question of saving life, but a question of mitigating that most frightful of human miseries—prolonged, continuous, severe bodily suffering; and this for a patient whose doom is certain, and to whom life has come to be for the most part a dire calamity. While you are bound, therefore, on the one hand jealously to guard life, I hold that you are equally responsible, on the other, that it shall be rendered fairly endurable. I confess that I have felt sometimes almost indignant at the sight of a poor fellow-creature, worn out with anguish, praying for death, who, thanks to a well-meaning but weak timidity, is permitted only such small comfort as fifteen or twenty minims of liquor opii, or of a solution of morphia, once or twice in the twenty-four hours, can afford.

For the relief of chronic retention of urine, such catheterism must be applied as the case requires, whether periodically or continuously, as the comfort and the exigences of the patient render desirable.

But I venture to hope that mere palliative measures are, in the future, by no means to form the whole of our therapeutic scheme for vesical tumours.

There are a few cases which have recently occurred, both in males and females, where the tumour has been sought in the bladder, by way of incision, and has been removed with complete success. Professor Humphrey, of Cambridge, removed one thus in the year 1877 from a young man whose symptoms were very severe, and to which there appeared to be no clue. It was a pedunculated tumour and a good but slow recovery followed. But very recently the following case has occurred in my own practice in London, and it happened that Professor Seegen of Vienna and Dr. Poggi of Florence were in town, and witnessed the proceeding in November 1880.

A man aged 29, had been the subject of small calculus, partly oxalate, partly phosphate, and I had removed it in the preceding spring by lithotrity at one sitting. The symptoms, however, did not disappear, but rather gradually increased. I crushed a phosphatic concretion for him once or twice subsequently, but found within the blades of my lithotrite on the last attempt, a mass which I could neither crush nor remove. I accordingly advised him to submit to an exploration of the bladder, making the incisions usually adopted in the median operation for stone. I searched the bladder thoroughly with my finger, having pressure firmly made by my assistant above the pubes, so as to bring down the upper part of the bladder within the reach of the end of my finger. I soon detected the presence of a rounded tumour, the size of a large chestnut, coated with calculous matter; introduced a small lithotomy forceps, and twisting it, ruptured the peduncle and brought away the mass without difficulty. The man had not a bad symptom, made a speedy recovery, and is in perfect health at this moment. I presented him to the Royal Medical and Chirurgical Society on April 11, 1882, just one year and a half after the operation.

In the course of my experience, I have now and then made the autopsy of a patient whose symptoms were obscure during life, resisted treatment, and terminated only in a premature and miserable death; and I have recognised too late the condition, which in the case just related was happily understood in time. I see no reason why the failure should be repeated. Careful and delicate sounding with a light flat-bladed lithotrite ought to go far in detecting such growths; but an exploratory incision like that I have referred to, and described at page 144, Lecture XX. is by no means dangerous. When therefore the evidence is strong in favour that some undiscovered cause exists in the bladder of a man whom, after careful examination, you can assert to be free from all the ordinary causes of severe vesical symptoms, the propriety of exploring the bladder by perineal incision should be considered. While such a proceeding is not to be too lightly undertaken, I believe that we shall do well to put it in execution when we have before us a patient evidently doomed, if we have nothing to offer him in the way of treatment but merely palliative measures.

LECTURE XXIII.

ON HÆMATURIA AND RENAL CALCULUS, AND THE OPERATIONS FOR REMOVING IT.

GENTLEMEN,—I propose to-day to complete the programme I originally designed for this course by considering a phenomenon of common occurrence known as Hæmaturia.

Let us define the term. What is Hæmaturia? The outflow of urine containing blood in admixture. Thus bleeding from the penis at other times than that of micturition is of course not hæmaturia. Bleeding coincident with micturition from chordee or operation, or from any known injury in the course of the urethra, is also not to be included in the meaning of the term. The blood in these circumstances usually issues by the side of the stream of urine, and is only partially mixed at its line of contact, or it may follow rather than accompany the urine.

Hæmaturia, then, is a symptom. Its presence is, in all cases of urinary disease, to be sought. Hence the inquiry forms one question—the third—of the necessary four which I instructed you always to ask in forming a diagnosis. Here is a glass of urine, evidently containing an admixture of blood. What is the source of it? Now, it is often not an easy thing to state at once what point of that long and complicated organic apparatus, which commences in the Malpighian corpuscles and ends at the external meatus, is the source of the blood in question. Sometimes it is exceedingly difficult to define its source. Thus it is that in medicine you will often find some symptom, the pathological cause of which is not very obvious, getting a specific name, and coming at length to be erroneously regarded as a distinct disease; and just as you will be asked, as I told you the other day, what is good treatment for dropsy, you may also be asked what is good treatment for hæmaturia.

Now, the consideration of this question, besides affording us new material for inquiry, will bring us again upon ground we have already travelled over together. I don't regret that—for your sakes I mean. It will stand in the same relation to the past as the arithmetical 'proof' does to the already worked sum. It is in some respect a synthetical operation following an analytical one. When, therefore, you see a specimen of urine containing blood, you will, as a matter of course, make a rough mental note of the proportion of blood present, and you will mark the colour. And as you can count on your fingers the ordinary sources of blood, these will pass rapidly in review at the same time. Let us name them as follows:—

1. The kidneys; where hæmaturia may arise from diseased action more or less temporary, as inflammation; or from disease more or less persisting, as degeneration of structure; or from mechanical injury, as by calculus there; or by a strain or a blow on the back. If the hæmaturia is the result of inflammation, there will be general fever denoting its presence; if produced by slow organic change, there will be the history of failing health, and probably urine changed in quality otherwise than by the mere admixture of blood. When blood is intimately mixed in very small quantity, as it is sometimes, note the characters of the urine proper—it may be of low specific gravity, pale, with albumen in greater proportion than blood or pus will account for; perhaps renal casts may be found—and inquire for the existence of dropsies in any form or degree. In the preceding conditions described, if blood is present, it will give a 'smoke' tint to the secretion. Perhaps it may be affirmed that such urine, associated with very little if any local pain, is more likely to come from the kidney than elsewhere. In malignant renal tumour, blood may be large in quantity at times; the rapidity of growth and considerable size attained are the marked characteristics of the disease. If mechanical injury be the origin of hæmaturia, there will be the history of a blow or strain; or there may be the signs and symptoms of renal calculus, of which more detail presently.

2. Then, putting aside the ureters, you will remember the bladder as the second source of hæmorrhage; and here it may be due to severe cystitis, calculus, or tumour. The first is obvious enough from muco-pus in the urine, and other signs; while the second may well be suspected by the symptoms, and its pre

sence realised by the sound. Here the hæmorrhage is usually florid, and in proportion to the patient's movements. But the third condition—namely, that the hæmorrhage arises from tumour—is not always so readily to be affirmed. As a rule, however, blood from such a source is larger in quantity than from stone, and may be associated with less of muco-pus. If the tumour is malignant, it may be felt by rectal or suprapubic examination, and the pain is often severe; if villous, it gives an even pale-red tint for days together to the urine; and in both cases the blood is florid, unless it is long retained in the bladder, when dark sanies, like coffee-grounds, results.

3. In hæmorrhage from the prostate, the third principal locality or source, a deep dark tint is often observed, if the organ is hypertrophied and the blood is retained; but here the age of the patient, the history of gradually increasing trouble, and the ascertained condition of the organ from the bowel, aid the diagnosis. A slight appearance of blood mixed with the last few drops of urine is not a rare occurrence in chronic prostatitis; this of course in younger subjects.

4. When bleeding arises from stricture of the urethra, the patient's history and the cause of the bleeding, almost always following the use of instruments, leave no room for doubt. From the use of instruments also in the bladder, hæmorrhage sometimes arises.

5. Lastly, it is not to be forgotten that occasionally blood is found in the urine from the action of violent diuretics, from purpura, in fevers, and in the hæmorrhagic diathesis.

Now for the treatment of hæmorrhage. When you have determined that its source is above the bladder—that is, in the kidney or in its pelvis, probably the first and most influential remedial agent is rest in the recumbent position. Whether from a lesion affecting the intimate structure, or from the mechanical irritation of a calculus in any part of the organ, rest is the first and the essential condition. The patient is, moreover, to be maintained in as cool and tranquil a state as possible.

It is in renal more than in any other form of hæmaturia, perhaps, that direct or internal astringents or styptics are useful. I shall do no more than name those which are most commonly used—namely, alum, gallic and tannic acids, lead, and turpentine; equal to them is, I think the infusion of matico, say in doses of two ounces every two or three hours. The tincture of the perchloride of iron, and also sulphuric acid may sometimes be taken with advantage. But see page 157 in the preceding lecture.

It is, however, in cases of severe hæmorrhage from the bladder, or more commonly from an enlarged prostate, that active and judicious treatment is necessary. You will be called sometimes to a patient whose bladder is distended with coagulated blood, or who is passing frequently a quantity of fluid in which blood is the predominating element. Usually this has arisen from some injury inflicted by the instrument, although it may also be from tumour of the vesical walls. Here you will keep the patient on his back, and forbid the upright position, or any straining, so far as you can prevent it, in passing water. To this end give opium liberally, to subdue the painful and continued action of the bladder. It has always been the rule of practice to apply cold by means of bags of ice to the perineum and above the pubes: it is more to the purpose to introduce small pieces of ice into the rectum. But I doubt very much the value of ice applications, externally, for vesical hæmorrhage. One thing is quite certain, that the cold has no penetrating power from the surface to that organ: and that the ice does not abstract a single particle of caloric therefrom. A thermometer in the bladder is not lowered a single degree by all the ice-bags you can apply. Whether it is of value by any indirect agency is another question; perhaps the spine would be a better locality if ice is to be used at all. When bleeding is severe, do not use an instrument if it is possible to do without it. There is a great dread in some people's minds about the existence of a large coagulum in the bladder. I have even known a bladder to be opened above the pubes by the surgeon, for the mere purpose of evacuating a mass of clotted blood. Leave it alone: it will gradually be dissolved and got rid of by the continued action of the urine: while if you are in haste to interfere with instruments, and are very successful in removing it, you will very probably also succeed in setting up fresh hæmorrhage. The bleeding vessels have a far better chance of closing effectually if they are not subjected to mechanical interference. Meanwhile support the patient's powers by good broths, or any nutritious food he can most easily digest.

But it sometimes happens that hæmorrhage occurs in a patient who has long lost all power of passing urine except by catheter. This is a very different position. Here the coagulated mass which fills the bladder must sometimes be removed, or no urine can be brought away; none issuing even if a catheter is passed, for the end of the instrument enters a mass of dense coagulum, and nothing escapes. Sometimes a portion of semi-liquid clot can be removed by attaching to a large silver catheter a six-ounce syringe or a stomach-pump. The lithotrity aspirator has answered remarkably well with me in two or three instances. Let me caution you, as a rule, not to inject styptics into the bladder in these circumstances; the irritation so produced generally does more harm than good. There are some few exceptions, but the injection of a powerful styptic into the bladder often produces painful spasm, a condition in which hæmorrhage is more commonly increased than diminished.

In passing to another subject, I beg to call your attention to a glass before you containing some urine of a dark and somewhat unnatural tint. Let us interrogate the patient from whom it came. In obtaining this specimen I took care that he should first pass about an ounce into a separate vessel, to clear his urethra—a precaution always absolutely necessary to avoid error, as I have before warned you—and the remainder of his urine into this. It is less translucent than average healthy urine is, and has a deeper colour. The hue is not red, but slightly orange, with a dirty grey-brownish tint, commonly and very well distinguished by the word 'smoky.' That tint denotes blood to an ordinarily practised eye. Why is it not red? Because blood, after a certain term of contact with urine, loses its red colour and becomes brown; and you see it in that condition, or according to the quantity, producing any depth of hue from this up to that of London porter. Put it under the microscope, and you will find abundance of blood corpuscles. We get this broad principle, then, to start with: bleeding from the more distant parts of the urinary system, unless in very large quantity, will almost certainly make the urine brown; while urine which contains red blood has almost certainly issued from some source in the bladder, probably at or near its neck, these being the more common sites of vesical hæmaturia.

In the case before us, then, we proceed easily and rapidly to eliminate many of the sources of bleeding by physical exploration, and by the account which the patient gives of his sensations. His age is forty-five years. He makes a good stream when a fair amount of urine has accumulated in his bladder, but this does not often happen, for he passes it every two hours, or less, in the day, not so frequently at night; no straining is necessary for the purpose of emptying the bladder. Pain in the course of the urethra is experienced during and after micturition; not severe. He is uneasy about the pelvis and loins on taking exercise, and more blood passes afterwards. He is somewhat emaciated, and so affords a good condition for examination by the hand. He is subject to variation in the intensity of the symptoms, having now and then attacks of a few days' duration, in which they are aggravated, and especially the left renal pain, which is sometimes very severe; and he dates their commencement from an attack which occurred seven years ago, which was accompanied by vomiting; this or nausea has recurred sometimes on these occasions since. He has never passed gravel. He is less robust than formerly; his digestion is not good. A full-sized bougie passes easily into the bladder; no stricture; hypertrophy of prostate at his age is not possible. On sounding he is manifestly more tender than usual; nothing is found in the bladder, nor is any deviation from the natural condition felt by simultaneous examination by the rectum. Palpation of lower part of abdomen shows nothing. Arriving close under the last ribs of left side with one hand, the other pressing firmly from the front on left renal region, he flinches unmistakably; that is the spot, he says, where he feels pain at times and on movement; on right side, nothing observable. We examine his urine: sp. gr. 1·018, acid, small brownish deposit on standing: under microscope blood-corpuscles, some pus-corpuscles, epithelium, no crystals, no casts; albumen, a little, but only corresponding with organic matters present.

What is the seat of the lesion in his case? You say, perhaps, the bladder:

we found it tender to the sound, and it acts with undue frequency. Yet remember this is by no means sufficient evidence of any primary morbid change there, this symptom constantly accompanying diseases affecting primarily the kidneys or the upper part of the ureter while the bladder is healthy. Much more probably the kidney. The history, the manifest local tenderness, the repeated attacks of pain there accompanied by nausea, the impaired health, the absence of all the more common causes of cystitis in any form, point to the left kidney as the seat of mischief. The absence of albumen and renal casts—a fact of not much weight, although their presence is of the utmost importance—lead us to believe him free from organic changes affecting the renal structure. I conclude that his left kidney is the seat of calculus, although he has never passed one, and has at present no crystalline deposit in his urine—a fact by no means essential to the diagnosis; and I do not doubt that this calculus is the source of the blood and pus found in his urine.

It is sometimes not easy to say what kind of calculus exists in these cases, of which this man's is a fair type. When any calculous matters have been passed which can be examined, or when the crystalline deposit in the urine is constant, the inference is pretty clear. Add to this that the probability in any case is strong in favour of uric acid, from its known frequency of occurrence—taking large numbers, say at least fifteen to one as compared with oxalate of lime.

For treatment: Alkaline diuretics and diuretic vegetable infusions, before named, for a period of time; attention to the digestive functions and to that of the skin, for the kidneys are probably working too much vicariously for some other function acting insufficiently; some mild form of counter-irritation over the renal region, moderation in highly nitrogenised food, a considerable proportion may be advantageously vegetable; mild alcoholic drinks if any—in most cases none should be permitted—and then only a light and mild Bordeaux. Of all medicinal remedies, perhaps none are so valuable as mineral waters, especially those which have sulphate of soda, largely diluted, as the main ingredient. For two well-known remedial agents, which are very *popular, each among its* class, I am bound to tell you I have very small esteem. Here in town it seems to me that every man advises his neighbour, and on every pretext, to drink Vichy or some other popular water, but always one that has been rendered so by dint of advertising—advice which is cheap, and of which the value in most instances by no means exceeds the cost. In the country, where perhaps the fairer sex more usually dispense similar aid to their suffering neighbours, the prescription is mostly gin-and-water. More recently, I regret to observe that even among our own profession, the recommending of whiskey has of late become a fashion. As for the well-known mineral water first named, which is a strong solution of carbonate of soda, I must say that, if not absolutely injurious, it is at least greatly inferior to potash. In regard of the two alcoholic agents, it is impossible to say more, or indeed less, than that they are about as serviceable to the kidneys as a pair of spurs to a jaded horse—makes him travel for a time, but takes it out of him in the long run. The subject has, however, been treated in detail in the sixteenth lecture.

For the paroxysms of severe pain which denote the passage of a renal calculus, you will find hot hip-baths, prolonged or often repeated, of the greatest service; the temperature may be increased to anything the patient can bear. The application of a hot linseed poultice, the surface of which has been sprinkled with strong flour of mustard, an excellent rubefacient at all times for this region, may intervene, or be substituted for the bath. The patient should be allowed large doses of opiate, also, to assuage severe pain; and abundance of barley-water, potash-water, or the like, for drink.

Now, if the pain of renal calculus long persists and is severe, the patient's activity becomes so impaired as to interfere greatly with the necessary occupations of life. He is disqualified for pursuing his labour, whether physical or mental, and until late years it must be confessed that no alternative but to wait, with such patience as he could, has been afforded him.

But latterly, much has been done in the way of exploring, cutting down upon, and removing impacted renal calculus from its seat in the kidney, or in the pelvis, as the case might be. Moreover, the simple operation of making an incision down to the kidney, and removing a small stone is not necessarily a dangerous one; while there are cases on record in which, although no stone has been found, much relief has followed the incisions made.

The operations of nephrotomy, nephrolithotomy, and of nephrectomy, are different forms of procedure by which renal calculi (as well as tumours) have been removed. I will briefly advise you as to what experience has taught us in relation to this important subject; and let me add that my friend Mr. Barker, assistant surgeon to our hospital, has contributed very considerably to our knowledge respecting it.

When in a patient of either sex, or at any age, there is reasonable ground for the belief that renal calculus exists, and is the cause of much and persistent suffering, an incision should be made in the situation for the performance of lumbar colotomy on the affected side. A nearly vertical incision should be made through the integuments of the space between the last rib and the crest of the ilium, followed by dissection through the tissues about the line of the anterior border of the quadratus lumborum. The fat surrounding the kidney is identified, and finally the kidney itself; and it suffices at first to lay bare the organ only to a small extent. By palpation with the finger, a hard body may be felt; if not, puncture should be made with a long needle in different directions for the purpose of detecting the hard body. This found, a slight incision may be made upon the needle towards the calculus, for on dividing the renal tissue blood flows very freely, soon ceasing however; but the incision should be further dilated by means of the dressing forceps, and if the calculus can be removed, all is well. A drainage tube is introduced to carry off urine, &c., and the wound is plugged round it. Thus much suffices for nephrotomy and for nephrolithotomy. When the stone is very large, or branched, or when the kidney is involved in a considerable tumour, removal of the entire organ will alone suffice; if the operation is to be carried further, in which case ligatures must be carefully applied to the renal blood-vessels, and to the ureter. But this operation for the removal of the kidney, or nephrectomy, may be also successfully completed by the abdominal section, which ought to be an antiseptic procedure, in the strictest sense of the term. For most cases, I think surgeons will prefer the external route, unless it is for some special reason impracticable, because it avoids the risks of opening the peritoneal cavity.

I shall here, by way of conclusion, refer to a mode of determining the true characters of a patient's urine, which is of value in some doubtful cases—a mode which has never to my knowledge been hitherto recommended or practised, and which I have systematised for myself. I have already told you how essential it is to avoid admixture of urethral products with urine, if you desire to have a pure specimen, and how you may attain this object by the use of two glasses. It is sometimes quite as essential to avoid its admixture with products of the bladder. And I defy you to achieve an absolute diagnosis—by which I mean a demonstration, and never be satisfied with less, if it be practicable—in some few exceptional cases, without following the method in question. When, therefore, it is essential to my purpose to obtain an absolutely pure specimen of the renal secretion, I pass a very soft flexible catheter, of medium size, into the bladder, the patient standing, draw off all the urine, carefully wash out the viscus by repeated small injections of warm water (before shown to be rather soothing than irritating in their influence), and then permit the urine to pass, as it will do, *guttatim*, into a test-tube, or other small glass vessel, for purposes of examination. The bladder ceases for a time to be a reservoir; it does not expand, but is contracted round the catheter, and the urine percolates from the ureters direct. You have, virtually indeed, just lengthened the ureters as far as to your glass. And now you have a specimen which, for appreciating albumen, for determining reaction, and for freedom from vesical pus, and even blood, and from cell-growths of vesical origin, is of considerable value, and has often furnished me with the only data previously wanting to accomplish an exact diagnosis.[1]

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[1] Now and then, although very rarely, in some states of the bladder, the presence of the gum catheter itself will occasion a little blood to exude from the mucous membrane lining the cavity. This being obvious to the eye will show a source of fallacy, and it is never to be forgotten that a very small proportion of blood-admixture with urine will give rise to a large albumen deposit, on the application of the usual tests. The value of the

Mind never to be satisfied to guess at anything; make, very cautiously if you will, your provisional theories about a doubtful case—indeed, the intellectual faculty must constantly do this, and without reference to the will—but arrive at no conclusion, take no action, except so far as you are warranted by facts.

I have reserved these few words to the last, as the most important. The first words I uttered in this course were designed to convey to you my strong sense of the importance of acquiring the habit of making an accurate diagnosis, and a rapid one, if possible. My last shall be to express once more the same conviction. Not because I undervalue the subject of treatment, but precisely with the opposite view; being anxious, above all things, that you and I should afford some essential service to those who have confided to us the care of their maladies. I adjure you to spare no pains to obtain the most complete knowledge of the complaint itself, since it is the only mode of arriving at a knowledge of what will be sound and efficient treatment.

I beg to thank you for the extreme attention and assiduity with which you have followed me during this course, and to assure you that such a manifestation on your part has rendered our meetings for these colloquial discourses some of the most agreeable relaxations which have fallen to my lot, to vary the routine of an anxious and very active professional life.

[The next lecture, so called here, was not adapted for oral delivery, but is the reprint of directions for the examination of the urine which I drew up several years ago and printed separately for the use of my class.]

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experiment, however, is not in the way of making manifest the presence of albumen in any doubtful case, but in showing that when it is largely present in the urine ordinarily passed, the urine drawn direct from the kidney may, nevertheless, be without a trace of it—a most important fact to determine.

LECTURE XXIV.

THE EXAMINATION OF URINE FOR CLINICAL PURPOSES.

Healthy Urine.

The common or generally prevailing characters of healthy urine may be first stated, as affording the standard of comparison by which to estimate deviations existing in any specimen submitted for examination.

Healthy urine, recently passed, is transparent; possesses an amber colour, which may be faint, pale, full or dark, with a tint of orange-red, according to the degree of dilution in which the colouring matter exists. While fresh and warm, it has a characteristic odour. After standing a few hours, a faint light cloud is seen in the liquid, occupying about the lower fourth or third of the vessel in which it stands. Its specific gravity, at 60° Fahr., may be approximately regarded as varying between 1·010 and 1·030; the mean density being from 1·015 to 1·020.

Its reaction is slightly acid, and remains so until decomposition of the organic matter contained in the liquid has commenced. Heated to ebullition, its transparency remains. Mineral acids throw down no precipitates.

The quantity voided varies in different individuals, and in the same individual at different times, from the influence of season, food, exercise, &c. &c. From twenty-five to forty ounces in summer, and from thirty to fifty ounces in winter, may be considered as the average quantities; but considerable variations in quantity are consistent with perfect health. The solid matter contained in either case generally ranges between 700 and 900 grains in weight.

Rules for Examining Urine.

I.—The urine to be examined should be in quantity not less than two or three fluid ounces, and for the most part a portion of that which has been passed on first rising in the morning (urina sanguinis). Or a specimen of that which has been made at night (urina chyli) may be preserved also.

But no specimen is worth examining, inasmuch as it cannot be relied on as affording trustworthy indications, unless the urine has been separated, in the act of passing by the patient, into two portions. The first portion is to consist of a small quantity—say an ounce or so—sufficient to clear the urethra of any discharge which may happen to be in the canal. The second quantity is to consist of all that remains, which being passed through a urethra just flushed by the preceding portion, will be the true product of the kidneys, plus only any matters derived from the bladder itself. This is the portion which is to be submitted to the test hereafter described. Purulent matter originating in the urethra is often mixed with specimens of urine sent for examination, in which case it may be erroneously estimated as albumen by the chemical test; or as pus under the microscope may be supposed to have its origin from the deeper passages.

II.—Supposing it to be contained in a glass bottle, let the vessel be placed upright, with the cork downwards, allowing it to stand at least an hour, or two if convenient, for the purpose of permitting matters held in suspension by the urine to subside and adhere to the end of the cork: better still, place the urine in a tall conical glass; the deposit can be easily obtained by a glass pipette. But before the fluid is disturbed, let the following particulars be noted from simple inspection by the naked eye:—

The colour of the liquid; which may be pale straw, yellow, orange, red, or brown.

The degree of transparency.

The characters of the deposit; such as, whether it be floating, flocculent, and scanty; ropy, viscid, and tenacious; dense, heavy, and abundant; dark or light in colour.

Its composition may frequently be predicted from this inspection alone by attention to rules hereafter given.

III.—Next, remove the cork carefully, to the under surface of which a portion of liquid and deposit will be found adhering, sufficient in quantity for examination under the microscope. Transfer it by dabbing the wet cork upon a glass slide; immediately cover it with a piece of thin glass, and view under a good half or quarter inch object-glass. Generally speaking, I prefer the latter power, under which the accompanying illustrative figures were made.

IV.—We may now proceed to test the bulk of the urine as follows:—

Decant it into the ordinary hydrometer glass, observing the odour, which may be fresh and normal, ammoniacal or 'fishy,' or fœtid.

Determine the reaction by litmus paper, which, if the urine be acid, will be turned red; the intensity of the colour corresponding with the amount of free acid present. If reddened litmus be restored to its natural colour, or turmeric paper be rendered brown, the urine is alkaline. But urine which is acid when passed, may become alkaline by keeping, from the decomposition of the urea, and the consequent production of carbonate of ammonia. When mucus is present this change takes place with greatly increased rapidity. But sometimes urine will become more acid by keeping. The urine passed shortly after a large quantity of tea or coffee has been taken is often neutral, or slightly alkaline.

Take the specific gravity, bearing in mind the influence of temperature if very accurate observations are required. For example, there is a difference of 6° in the sp. gr. of the same urine, at the two temperatures of 40° and 70° Fahr., which may be considered as representing those of winter and summer respectively. Temperature of 60° is always *understood* in all urinary reports. The specific gravity of healthy urine generally ranges between about 1·010 and 1·030. If the sp. gr. be lower than 1·010, water is present in large proportion to the solid matters, a condition very commonly occurring in health.

The urine should next be examined for albumen in solution, the presence of which may be ascertained by adding nitric acid, or by applying a temperature of not less than 160° or 170° Fahr. In either case albumen is deposited in an insoluble form. The best method of applying these tests is, first, to heat a small quantity of the urine in a test-tube over the flame of a lamp, to the boiling point; if a flocculent whitish precipitate falls, it is either coagulated albumen, or an excess of earthy phosphates. Determine which, by adding a little nitric acid, which instantly dissolves the phosphates, but has no such effect on the albumen; bearing in mind that when the latter is present in very small quantity, too much nitric acid will dissolve the precipitate.

But when urine is alkaline, albumen is not precipitated by heat; in which case a small drop of nitric or of acetic acid—that is, *just sufficient to faintly acidify the mixture*—should be added. For it is not sufficiently pointed out in the directions ordinarily given for the performance of this test, that the presence of free nitric acid, in the proportion of one or two per cent. in albuminous urine, will prevent coagulation taking place when heat is applied. But if the necessary acidification is made with acetic acid, no difficulty will arise, as the presence of this acid will not hinder the coagulation of albumen. In all cases where the presence of albumen is suspected, the application of both heat and nitric acid is to be made, the effect of either being insufficient alone to constitute unquestionable evidence of its existence. The quantity of albumen may be approximately determined by observing the proportion which the coagulated deposit bears to the supernatant fluid, after the test-tube and its contents have been set aside for a time; and the time should be a constant one, such as fifteen minutes, to obtain similarity of results.

If the sp. gr. be high, as 1·030 or more, either the presence of sugar or excess of urea may be suspected. Or the urine may in such case be only a concentrated specimen, in which the fluid constituents exist in small proportion to the solids.

Diabetic urine has generally a sp. gr. of 1·030 to 1·045 or 1·050. Moore's test is a simple and efficient one for sugar. Boil the urine in a test-tube, with nearly half its bulk of pure liquor potassæ for two minutes, when, if sugar be present, the liquid acquires a brown colour of greater or less intensity. Trommer's test, consists in the addition of about a third of its bulk of a solution of sulphate of copper [10 grains to one ounce of distilled water] to the urine in a test-tube. Sufficient liquor potassæ must then be added to produce a precipitate of the oxide of copper, and to re-dissolve it. The greenish-blue liquid is heated until *it boils, when, if grape* sugar be in solu*tion, a red precipitate* of the suboxide of copper is thrown down. But a more certain test than Trommer's, is Fehling's standard copper solution, by which also the sulphate is reduced to the dark orange sub-oxide, by the presence of grape sugar. The most convenient mode of employing it clinically, is in the dry form of 'pellets,' which are portable; each containing enough for solution in one drachm of water in a test tube. A little of the suspected urine is added to this, the mixture is boiled, and the presence of sugar is shown by the precipitate described.

There is also the fermentation test, by which the presence of Torula cerevisiæ is determined when sugar is present; but it is unnecessary to describe the process here.

The presence of urea is thus determined. To a small quantity of urine in a test-tube, add half the quantity of pure nitric acid. Place the tube in cold water; flat rhomboidal or hexagonal crystals of the nitrate of urea soon appear in the fluid, if urea is present in excess. The acid gives no such result in urine of the normal composition.

If the urine be unusually high in colour, the cause may be an admixture of blood, when it will be either red or brown; or of bile, when it will have an orange or a bright 'burnt sienna' tint.

If it be due to the presence of blood, the colour, which may vary between that of porter and the faintest tint of red, disappears on simply boiling some of the fluid in a test-tube, the contents of which at the same time become opaque, and a deposit of dark coagula will take place, proportioned in amount to the quantity of albuminous matter present. Blood corpuscles will always be seen under the microscope.

If not due to blood, wet the surface of a white plate with some of the urine to be examined, and let fall a few drops of nitric acid upon it, and if the colouring matter of bile be present, a brilliant play of colours (green, violet, red) around the acid will be instantly observed, which is transient in its duration. But if the bile be small in quantity, the appearance described will not be well exhibited unless the urine be concentrated by evaporation.

V.—Examination of the deposit by the naked eye.

If a dense deposit be white, yellowish, or pink, and disappear by heat, it is almost certainly urate of soda. Sometimes this deposit has a dark red or brown colour. The urine in any case is almost invariably acid. The deposit of urate of soda completely disappears on heating the urine containing it.

If a dense white deposit do not disappear by heat, it is almost certain to be composed of the triple phosphates, in which case it will be dissolved by either acetic or nitric acid, and remain unaltered by the addition of ammonia or liquor potassæ. The urine is generally neutral or alkaline.

An orange or red deposit, which is visibly granular, sandy, or crystalline, is uric acid.

Oxalates do not form a visible deposit, although when large and numerous, the naked eye will often detect innumerable small glittering points of light floating throughout the specimen containing them. They differ from the triple phosphates, small crystals of which they might be perhaps confounded with, by being insoluble in acetic acid, although dissolved by nitric and hydrochloric acids.

If a deposit be slight and flocculent, and unchanged by nitric acid, it consists chiefly of healthy mucus and epithelium.

If a pale, opaque, homogeneous layer, easily miscible with the urine, settle to the bottom of the vessel, and the urine be acid or neutral, it is almost certainly pus. If so, albumen may be detected in the deposit by heating it, and adding nitric acid, and in the supernatant fluid also, in small quantity. Lastly, agitate an equal quantity of liquor potassæ with a portion of the deposit, and if the latter be pus, a dense gelatinous mass will result; while if it be merely mucus, it will be less dense than before. If the deposit be more or less transparent and gelatinous, ropy, glairy, and tenacious, perhaps containing minute air-bubbles, and is not miscible with the urine, it is probably mucus or muco-pus only, and the urine is generally alkaline. If the urine is acid, such a deposit is certainly mucus. But in alkaline urine, pus forms an opaque and glairy deposit. A glairy deposit may be opaque from the presence of phosphates; if so, a drop or two of nitric acid will dissolve them and render the deposit comparatively clear. The microscope will most readily decide the question, especially when the deposit is small in quantity.

Liquor puris contains albumen. Liquor muci does not.

Acetic acid has no visible effects upon an admixture of pus and urine. Added to urine containing mucus, a wrinkled membrane-like matter is seen floating through it, presenting a very characteristic appearance.

VI.—In examining the deposit under the microscope, any doubt respecting its elements will be cleared up.

Under the quarter-inch object-glass, the ordinary appearance of the deposits commonly met with are as follows:—

Uric Acid. (Fig. 68.)—Primary form, rhombs, of which numerous modifications are seen (*a a*); the most common exhibiting angles which are truncated or obtuse. It occurs most commonly in lozenge-shaped crystals, and rhomboidal prisms, of which the size and thickness vary greatly. Colour, usually pale amber, like that of barley-sugar, but the tints range between faint straw and deep orange-red. Sometimes in shapeless masses of cohering prismatic, or lozenge-shaped crystals (*b b*); these are the 'red sand' and 'cayenne pepper' deposits which are seen by the naked eye.

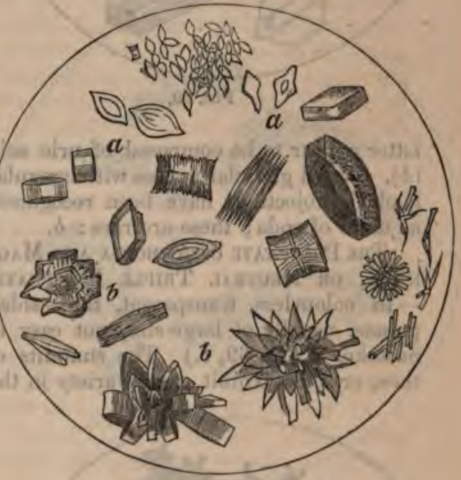

Fig. 68.

Urate of Soda generally appears as a dark amorphous deposit which a high power shows to consist of minute particles cohering to a greater or less extent, in strings or masses. Fig. 70 (*a a*).—This is, perhaps, the most frequently occurring precipitate which is deposited from the urine. Rarely it assumes the form of minute opaque balls of a reddish or reddish-yellow colour, either with or without little projecting spiculæ, which latter appear to be composed of uric acid (*b*). Small globular masses with irregular hooked projections have been recognised as urate of soda; these are rare: *b*.

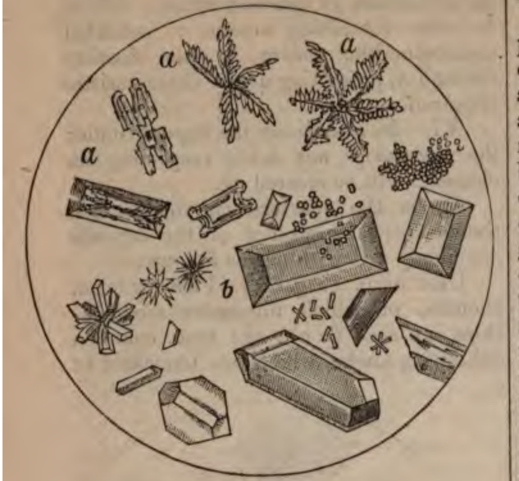

Fig. 69.

The Phosphate of Ammonia and Magnesia, or Neutral Triple Phosphate.—In colourless, transparent, three-sided prisms, usually of large size, not easy to mistake. (Fig. 69, *b*.) The summits of these crystals exhibit great variety in the form and number of their facets. Occasionally it occurs in the stellar form, om the coherence of several small prisms, or as a rosette, where the crystals are acicular and in great number. Very rarely the neutral triple phosphate appears in double penniform crystals.

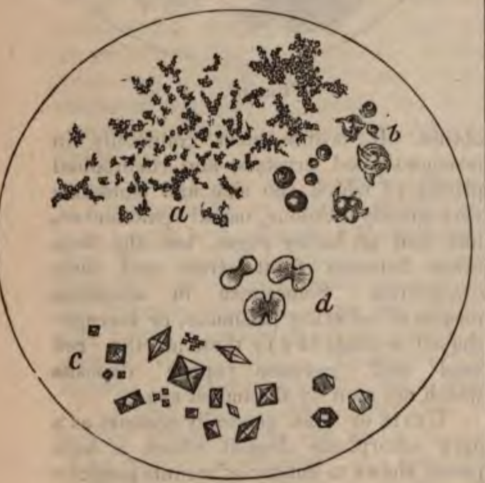

Fig. 70.

The bibasic form of the triple phosphate occurs in foliaceous and stelliform crystals, and is found in stale and highly alkaline urine, never in that which is acid. It appears to be a secondary formation occurring in the urine after it has been passed, and very frequently to be developed from pre-existing prismatic crystals of the neutral phosphate by gradual change. First, the prismatic crystal becomes cleft at each extremity, then slight indications of the foliaceous markings are seen diverging from near the centre to each angle, so that by degrees four branches are developed, somewhat in the form of a cross, while the angular outline of the original crystal disappears. Two new branches are frequently added afterwards, and thus the six-rayed form of this salt is produced; *a*, *a*, *a*, *a*, indicate these crystals in different stages of development, sketched by myself from two specimens at different periods in the course of three days.

Phosphate of Lime occurs sometimes as a pellicle on the surface of alkaline urine, usually of minute granules; and it is often deposited with crystals of the neutral triple phosphate, adhering to them, and lying free in the field. Fig. 69.

Oxalates.—Common in sharply-defined octahedral forms, colourless and transparent; of all sizes, some being exceedingly minute. (Fig. 70). Very rarely, indeed, in a dodecahedral form, *c*. This deposit is sometimes replaced and sometimes accompanied by small crystalline bodies, described as possessing a 'dumb-bell' form (*d*). Their appearance is rare as compared with that of the octahedra. Probably their constitution is not the oxalate, but the oxalurate of lime, a closely-allied salt.

Red Blood Corpuscles.—Small circular flattened disks, with a faint yellowish tint; smooth, semi-transparent, and non-granular; slightly concave on each face, but plump and almost spherical in urine of low specific gravity from endosmosis; sometimes shrivelled, with serrated edges, or burst. The diameter is about the $\frac{1}{3500}$ of an inch in the natural flattened state, but when distended, in urine, is somewhat less. There is no nucleus in the red corpuscle. The white blood corpuscle is larger, varying in size from the $\frac{1}{3000}$ to the $\frac{1}{200}$ of an inch in diameter; it exhibits a tripartite nucleus on the addition of acetic acid. (Fig. 71, *c* and *d*.)

Pus Corpuscles. (Fig. 71, *a*, *a*.)—Variable in size, generally larger than blood corpuscles; from about $\frac{1}{3000}$ to $\frac{1}{2000}$ of an inch in diameter, white, rather opaque, granular aspect externally, with two or three nuclei, sometimes four, often faintly seen, but made distinct by the addition of acetic acid (*b*).

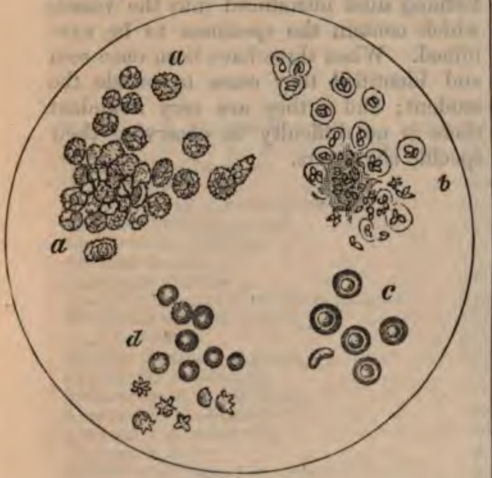

Fig. 71.

Mucus contains no specific corpuscle. Any such bodies in it are probably pus corpuscles, with which it is most frequently mixed.

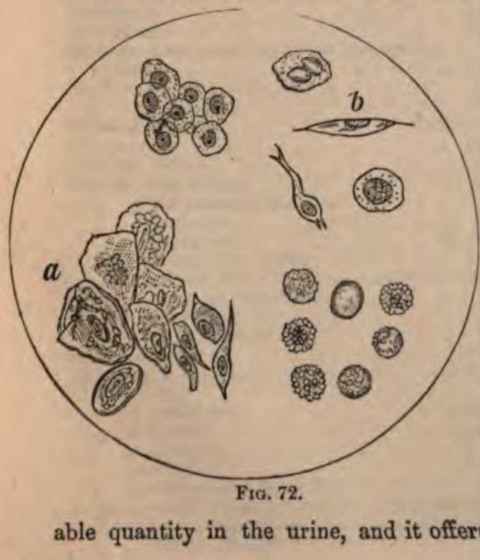

Fig. 72.

Epithelium is often found in considerable quantity in the urine, and it offers bodies of various form to the observer: flat and spheroidal; the former largely in the urine of women; round, oval, and caudate, frequent in that of men. (Fig. 72, *a*). From parts of the bladder and the ureters, the epithelium is often prismatic or caudate (*b*) or oval. Small rounded epithelium, and the caudate or spindle-shaped variety, have often led inexperienced observers to form conclusions in relation to the presence of cancer, which have not been warranted; a subject referred to at page 156, Lecture XXII.

Urinary Casts of the uriniferous tubes of the kidney. (Fig. 73.)—In acute nephritis, epithelial casts are always thrown off in abundance; and blood corpuscles may often be found in the cast. The character of the cast is more 'granular,' with less of epithelium, in chronic nephritis. In fatty degeneration of the kidney, the cast contains oil globules. A semi-transparent cast, containing few or no organic corpuscles, known as the 'hyaline' or 'waxy cast,' appears in renal changes of a chronic kind. No doubt an occasional cast may be found in the absence of renal disease; but when their appearance is persistent, some organic change, either acute or chronic, is certainly present.

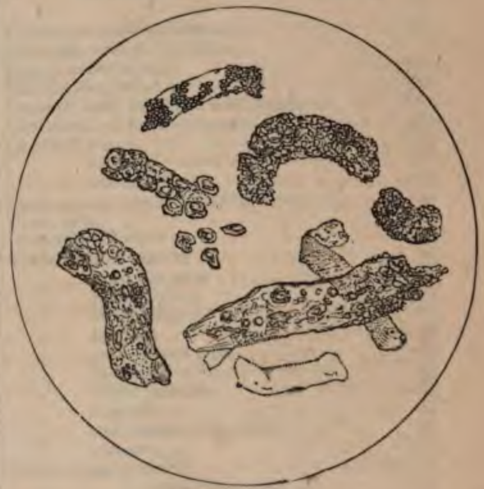

Fig. 73.

Pigment.—Little bodies of irregular form, of an orange or orange-red colour, are frequently seen in urine. Some of these are partially transparent; and some opaque, and thus almost black. They are sometimes confined by a cell-wall, and sometimes they present an amorphous character. They are evidently pigmentary in their nature, and have no pathological import.

Spermatozoa are frequently to be found in the urine of those who are perfectly healthy. When their presence is constant, and then only, is the circumstance to be attributed to disease.

Vegetable Fungi appear in urine very soon after it is passed, in certain conditions. In acid urine, the 'Penicilium glaucum' appears: the 'Torula cerevisiæ,' or yeast-plant, in diabetic urine.

Vibriones appear very quickly in urine soon after it has been voided, especially in hot weather. Under this term are included both vegetable and animal organisms, endowed with spontaneous movements. In some specimens of urine they exist before it leaves the bladder.

Accidental Bodies, met with in the microscopical examination of the urine, are chiefly hair, cotton, and flax fibres, feathers, woollen, silken, and woody fibres, forming dust introduced into the vessels which contain the specimen to be examined. When these have been once seen and identified they cease to puzzle the student; and as they are very abundant there is no difficulty in observing their specific characters.

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